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Volume 42 September 2005 Number 2

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Haec Credimus

For in six days the Lord made heaven and earth, the sea, and all that in them is, and rested on the seventh.—Exodus 20:11

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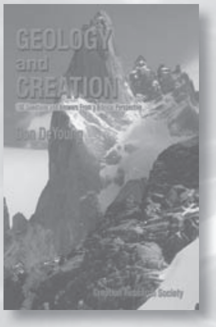
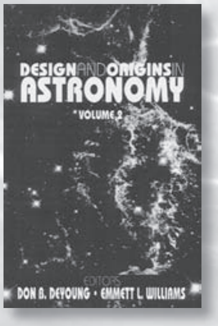


Geology and Creation: 100 Questions and Answers from a Biblical Perspective

Don DeYoung. 2004. CRS books, 163 pages. $12.00.

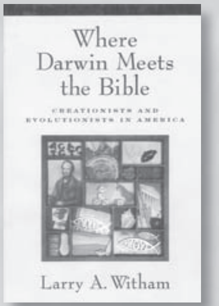
Geology and Creation presents non-technical answers to 100 of the most-asked questions in earth science. Dr. DeYoung shows that geology, properly interpreted, supports a recent creation and catastrophic events such as the global food of Noah's day.


DESIGN AND ORIGINS IN ASTRONOMY
VOLUME 2
EDITORS
DON B. DEYOUNG • EMMETT L. WILLIAMS

Design and Origins in Astronomy, Volume 2

Don B. DeYoung and Emmett L. Williams (editors). 2002. Creation Research Society, 163 pages. $11.00.

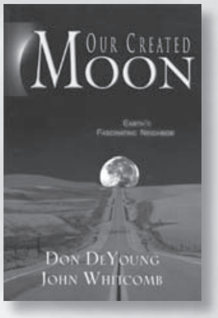
This is number 12 in the monograph series and the second volume on astronomy that is a compilation of articles from the *Creation Research Society Quarterly.* Topics include the age of the sun, impact craters in Arizona and on the moon, planets and magnetism, speed-of-light studies, stellar evolution, the destiny of comets, and mysterious dark matter.


Where Darwin Meets the Bible
CREATIONISTS AND EVOLUTIONISTS IN AMERICA
Larry A. Witham

Where Darwin Meets the Bible: Creationists and Evolutionists in America

Larry A.Witham. 2002. Oxford University Press, 330 pages. $25.00 (hard cover).

Author Witham, a reporter for *The Washington Times,* objectively discusses the creation-evolution controversy. The book is comprehensive, and is very important for helping creationists and evolutionists understand the pertinent issues.



Our Created Moon—Earth's Fascinating Neighbor

Don DeYoung and John Whitcomb. 2003. Master Books, 144 pages. $11.00.

Using a question- and answer-style, the authors present a simplified and updated version of their 1978 book on the moon. Sections include the characteristics, origin hypotheses, and purposes of the moon. Answers to critics make up the last section.

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The Tertiary Stratigraphy Surrounding Americus, Georgia: Evidence in Support of the Young-Earth Flood Framework

Carl R. Froede, Jr.*

Abstract

Uniformitarian scientists define their stratigraphic column using fossils linked to type sections, with the expectation that the rock record should exhibit evolutionary trends in its strata. However, such is often not the case. A significant portion of the "Tertiary" section exposed along road cuts and in open-pit mines near Americus, Georgia is barren of both body fossils and trace fossils. Hence, there is sparse evidence to support the assertion that the strata reflect millions of years of evolution. Instead, these sediments exhibit features suggesting high-energy deposition. The field data are more amenable to an interpretation within the young-Earth Flood framework.

Introduction

Modern stratigraphy has codified rules for mapping and age-dating strata in the North American Stratigraphic Code (1983) and the International Stratigraphic Guide (Salvador, 1994). Field geologists apply these rules to determine the proper sequence of strata and their corresponding age-dates. The paleontologic contents (e.g., trace and body fossils) of the various rock layers are crucial for defining the stratigraphic position and ages of the rocks, because uniformitarian scientists believe that history can be measured by evolution, documented by fossils contained in the sediments.

Most strata appear to have been deposited in a subaqueous marine settings. Uniformitarians insist that life has been evolving for hundreds of millions of years. That much life over that much time should have left plentiful body and trace fossils throughout the rock record. However, this is not always true. In fact, the vertical rock record for any given location typically contains few fossils, and those are usually concentrated in specific zones or along bedding contacts, and not evenly distributed throughout the column. Uniformitarian scientists do admit the paucity (perceived or otherwise) of paleontological content from sedimentary strata (Lawrence, 1968; Stephens et al., 1973), but explain it away with a variety of *ad hoc* interpretations in order to defend their assumptions of evolution and deep-time. It is hard to argue support for a model or concept from nonexistent data. To invoke special conditions to explain the loss of data is not good science.

Because uniformitarians emphasize pigeonholing strata within their geologic column (Reed and Froede, 2003; for a discussion of the difference between the conceptual uniformitarian column and the physical rock record), there is little emphasis placed on sedimentary structures and their hydraulic implications. For example, evidence of rapid, high-energy deposition is seldom carried to its logical conclusion by uniformitarians and assigned to local catastrophes. Creationists find sedimentary indicators of hydraulic conditions more relevant.

Southwestern Georgia displays a number of interesting outcrops of the Fall Line Hills District, in the East Gulf Coastal Plain Section (Clark and Zisa, 1976), a wedge of mostly marine sediments that thickens out onto the continental shelf. Its sediments supposedly record eustatic rises and falls between the late Mesozoic and the late Cenozoic eras. Recently, several Tertiary exposures were investigated in the region surrounding Americus, Georgia (Cocker and Costello, 2003). The period of uniformitarian time reflected by these sediments is immense, but details of the section appear to favor a young-earth catastrophic interpretation.

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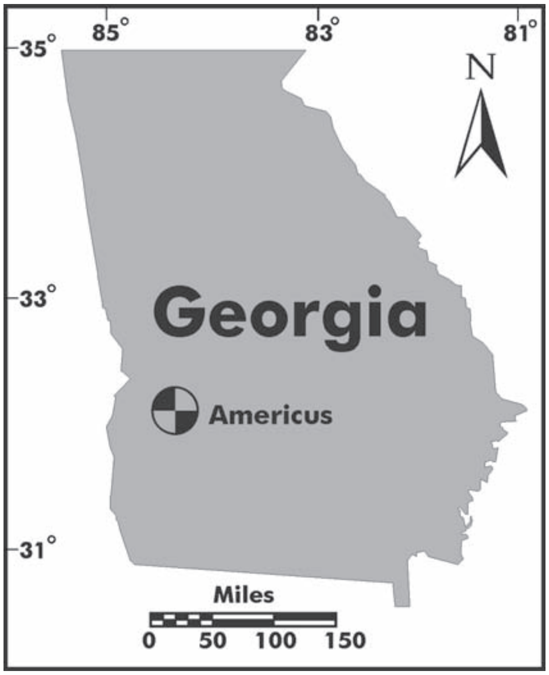


Figure 1 (above). Georgia map showing the study area near Americus.

Period	Epoch	Group	Formation	Ma
Quaternary	Recent		Unnamed Stream Alluvium	
	Pleistocene		Unnamed Stream Alluvium	5.0
Tertiary	Miocene		Unnamed Stream Alluvium Altamaha Formation	25
	Oligocene	Chickasawhayan	Residiuum	
		Vicksburgian	Residiuum	37
	Eocene	Jacksonian	Ocmulgee Formation Williston Formation Muckalee Limestone Clinchfield Formation	
		Claibornian	Perry Sand/Lisbon Formation Tallahatta Formation	
		Sabinian	Hatchetigbee Formation	
	Paleocene		Tuscahoma Formation	53
			Nanafalia/Baker Hill formations	
		Midwayan	Porters Creek Formation Clayton Formation	65
Cretaceous	Gulfian	Navarroan	Providence Sand	
		Tayloran	Ripley Formation Cusseta Sand	
			Blufftown Formation	75

Figure 2 (right). Conceptual uniformitarian stratigraphic column of southwest Georgia. Note the purported duration in time. (Modified from Bennison, 1975; Braunstein et al., 1988; Cocker and Costello, 2003; Huddlestun, 1981; Reinhardt et al., 1994.)

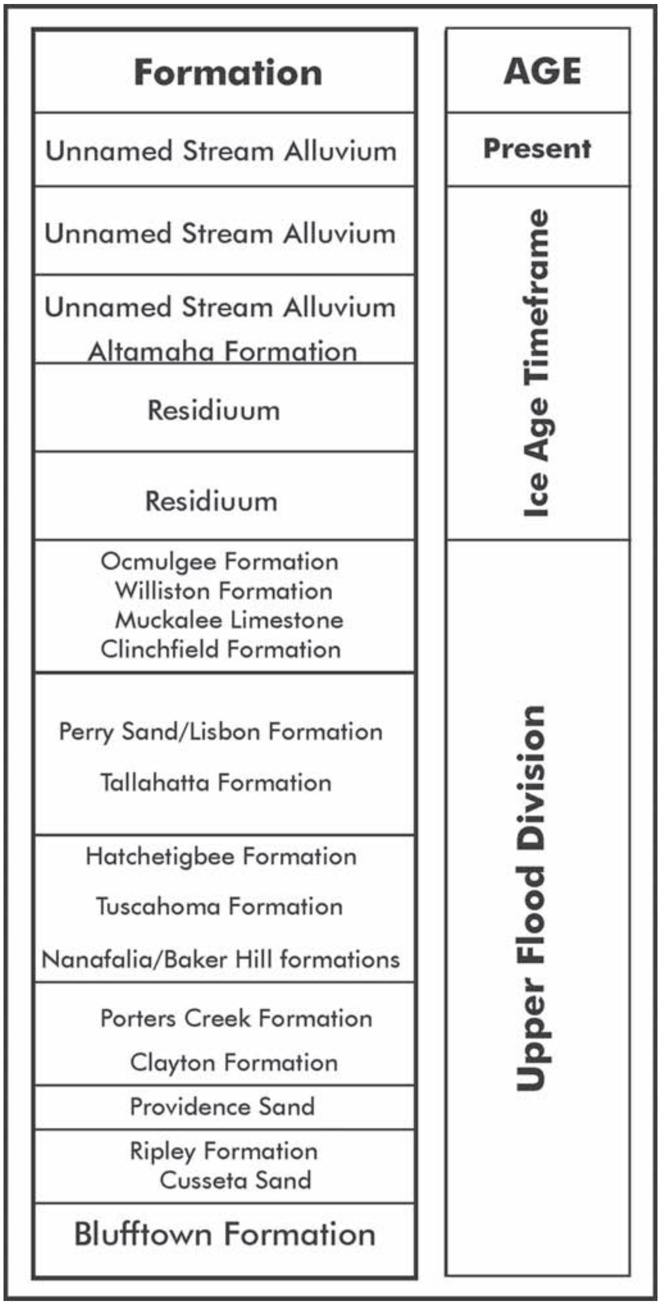
The Tertiary Section Surrounding Americus, Georgia

Uniformitarian geologists working the Tertiary stratigraphy around Americus, Georgia, (Figure 1) recognize a number of sedimentary units. While several road cuts were examined, the best exposures were found in open-pit quarries. Numerous stops were visited but few fossils were encountered. Therefore, uniformitarian scientists have been forced to use lithologic properties of the sediments to delineate the strata. As a result, stratigraphic interpretation tends to focus on the color and lithologic changes in the sediments. This procedure has more in common with Walther's concept of facies than evolutionary stratigraphy.

From the uniformitarian perspective, the lack of paleontologic control should prevent accurate stratigraphy. There is no sure means of determining what portion of the original time-rock record has been removed, and what portion remains. Yet, that uncertainty is not reflected in the interpretation (Figure 2). The absence of evidence for life that purportedly spanned 40 million years seems strange, especially considering that most of the exposed strata have been interpreted as deltaic to nearshore marine. Modern examples of this setting teem with creatures, and at least some minimal trace should be expected in the sediments. Rather than a well-ordered evolutionary sequence of fossils, the sediments composing the Tertiary strata contain sedimentary features reflecting high-energy hydraulic conditions.

Interpretation within a Young-Earth Flood Framework

Many creationists recognize the inapplicability of the uniformitarian stratigraphic column to creationist stratigraphy (Froede, 1994, 1995, 1997, 1998; Reed, 1996a, 1996b, 2001; Reed and Froede, 1997, 2002; Reed et al., 1996). For example, the Tertiary strata in the area surrounding Americus are believed to represent a period of



Formation	AGE
Unnamed Stream Alluvium	Present
Unnamed Stream Alluvium	Ice Age Timeframe
Unnamed Stream Alluvium Altamaha Formation	
Residiuum	
Residiuum	
Ocmulgee Formation Williston Formation Muckalee Limestone Clinchfield Formation	Upper Flood Division
Perry Sand/Lisbon Formation Tallahatta Formation	
Hatchetigbee Formation Tuscahoma Formation Nanafalia/Baker Hill formations	
Porters Creek Formation Clayton Formation	
Providence Sand	
Ripley Formation Cusseta Sand	
Blufftown Formation	

Figure 3. Conceptual column of southwest Georgia within the framework of the Genesis Flood.

time extending from earliest Paleocene (65 million years) to the close of the Miocene (5.3 million years). Interpreting these sediments in light of the Genesis Flood renders the uniformitarian stratigraphy moot (Figure 3). Instead, it is incumbent on creation scientists to examine the physical properties of the sediments in question and reason from effect to hydraulic and environmental cause (Froede, 1995, 1998, Reed and Froede, 2003). A key parameter in this kind of investigation is energy; expressed in terms of hydraulic flow conditions reflected by the sediments. Despite the short time frame constraining creationists, empirical evidence has demonstrated that thick accumulations of even thinly laminated sediments can accumulate in a matter of days (Austin, 1991).

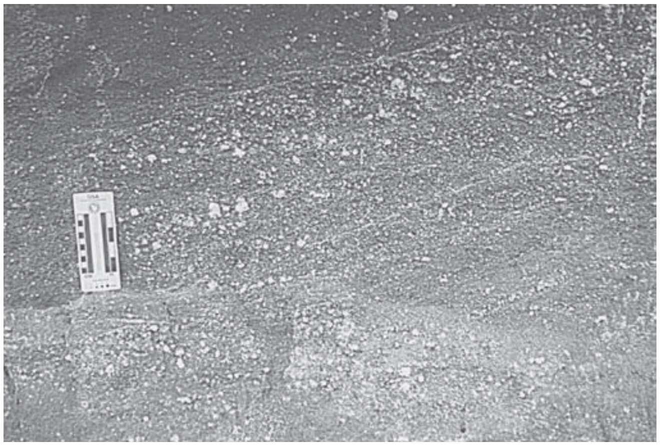


Figure 4. Sandstones of the Nanafalia Formation. The kaolin clasts were eroded from large clay layers, indicating significant current energy. Scale in inches and centimeters.

The various exposures of strata in the region near Americus present excellent locations to examine the succession of sediments. Many of the lithologic layers contain sedimentary features and structures indicative of erosion, transport, and deposition on a large-scale. Figure 4 shows coarse-grained and crudely cross-bedded sandstone containing abundant marble- to pea-size kaolin clasts in the Nanafalia Formation. The kaolin clasts reflect a high-energy erosional setting; it requires significant current energy to rip up clay, much greater than that necessary to erode and transport quartz sand. Figure 5 shows a roadside exposure of a channel later filled with the Altamaha Formation. The total uniformitarian duration of time between the channel filling Altamaha Formation and the underlying Providence Formation is 40 million years, but there is no paleontological evidence to support that conclusion. Their interpretation is based on color and lithologic changes in the sediment; parameters that are easily independent of time.

Figure 6 shows the northwest wall of the Guy-Pierce Mine. Uniformitarian scientists believe that this 30-foot high exposure represents approximately 14 million years. Changes in lithology are interpreted to reflect different stratigraphic units and their corresponding ages, but once again none of the strata contain fossils. Sedimentary structures suggesting high-energy deposition also explain the lack of fossils, and would also indicate a short interval

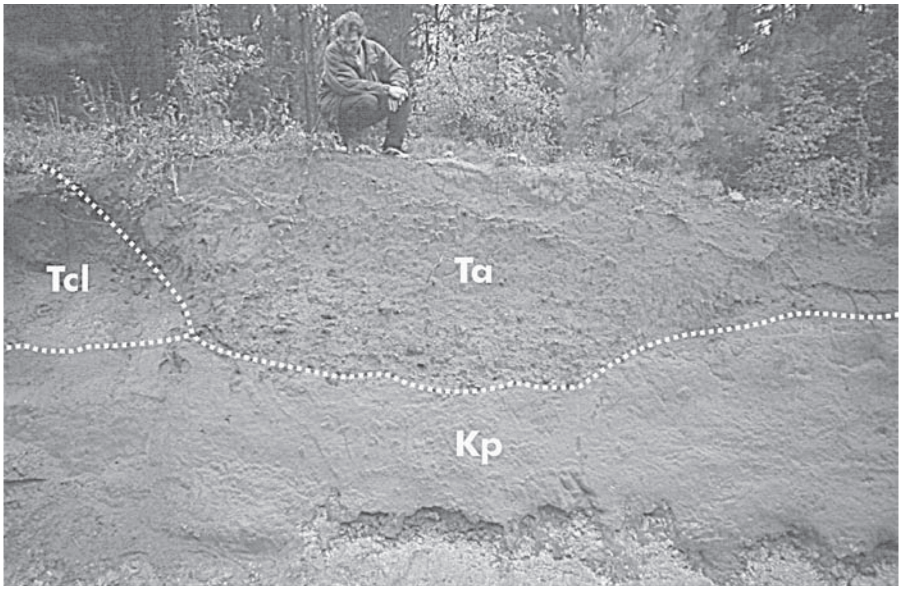


Figure 5. Roadside channel infilled by the Altamaha Formation. The uniformitarian duration of 40 million years is not supported by paleontological evidence. Key: Providence Formation (Kp), Clayton Formation (Tcl), Altamaha Formation (Ta). See Figures 2 and 3 for reference.

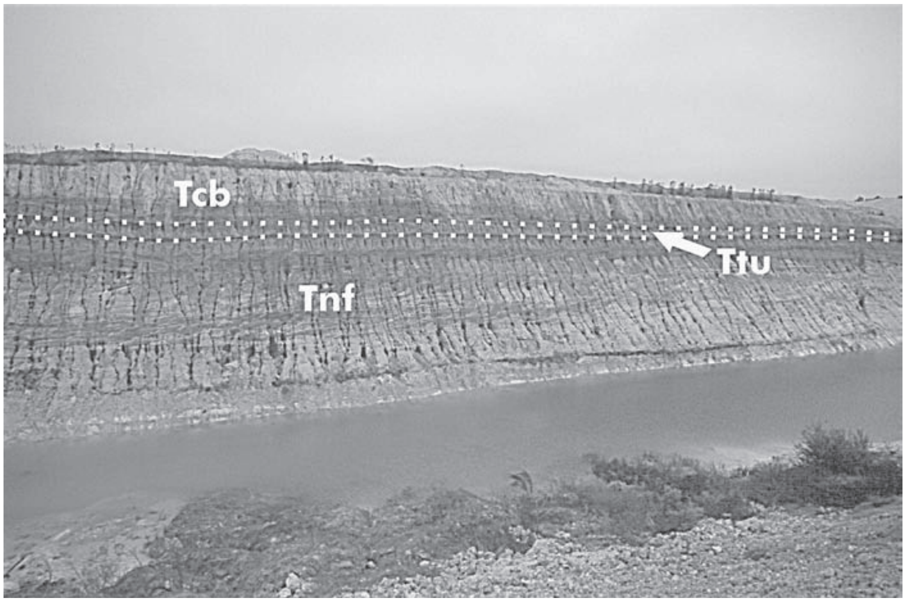


Figure 6. Northwest wall of the Guy-Pierce Mine (Mulcoa Plant). Stratigraphic key: Nanafalia Formation (Tnf), Tuscahoma Formation (Ttu), Claiborne Group, (Tcb). See Figures 2 and 3 for reference.

of time; conditions consistent with the young-earth/Flood framework. Figure 7 shows an exposed wall in the Fowler Mine. Uniformitarian scientists propose that this exposed section represents approximately 35 million years, but despite the supposed marginal marine setting, fossil evidence remains absent. As with other locales, the strata contain abundant evidence of high-energy deposition.

The strata in the Americus area present, then, a dual problem for uniformitarians. There is no fossil evidence to support their stratigraphic division of the rock record, and sedimentary features indicate energetic currents that would have deposited the sediments within a short period of time. Their reliance on lithology and color is evidence enough of their plight. Such changes are easily explained in terms of variations in the sediment source and the current energy; neither of which require significant amounts of time. It requires great faith to hang a multimillion-year history upon lithologic properties such as the color of a layer of sediment, especially in the absence of any significant trace or body fossil information.

I interpret the strata throughout the study area as reflecting high-energy geologic conditions extending from the close of the Flood, through the Ice Age Timeframe, and into our Present Age Timeframe (see Froede 1995, 1998). It is possible that fossils are absent because the energetic paleoenvironment was not conducive to the establishment of any marginal-marine habitats during so short a period of time. Another possible creationist interpretation might suggest that no hard-bodied invertebrate creatures lived in the area from which these sediments were originally derived (i.e., no formerly living creatures were removed from the eroded sediment source areas, transported, and buried with these sediments). However, this idea does not address the occasional occurrence of trace fossils in the sediments. Perhaps a more reasonable interpretation based on the stratigraphic setting and lithologic content would be that the near absence of any trace fossils and total lack of any body fossils reflect the short time available to marine creatures to establish themselves in a dynamic erosional and depositional setting.

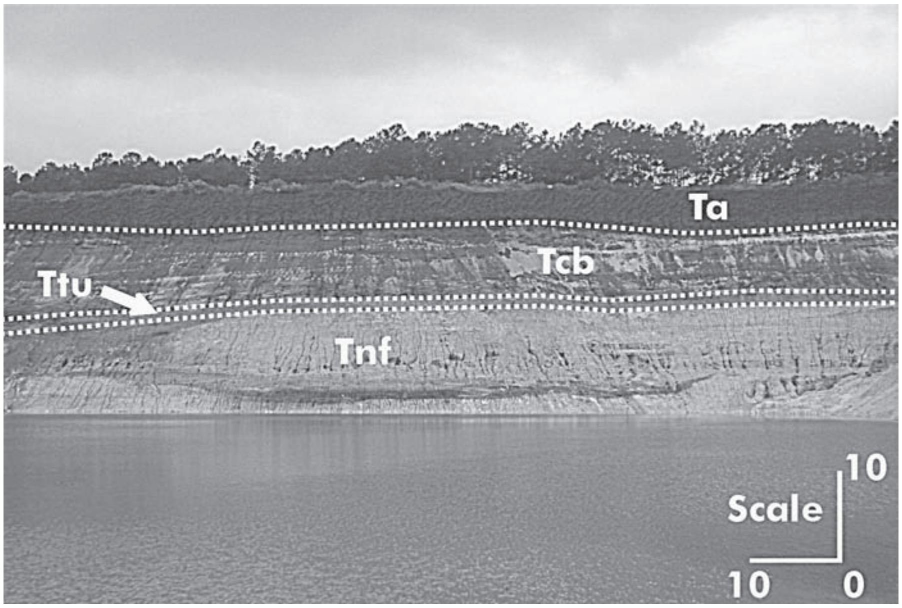


Figure 7. Exposed wall in the Fowler Mine (Mulcoa Plant). Scale in feet. Stratigraphic key: Nanafalia Formation (Tnf), Tuscahoma Formation (Ttu), Claiborne Group, (Tcb), Altamaha Formation (Ta). See Figures 2 and 3 for reference.

Conclusion

The purported passage of millions of years of Earth history should be represented by more than color or lithologic changes in sedimentary strata. Consistent with their own framework uniformitarians should be forced to provide fossil evidence of deep time or admit their ignorance when such evidence is absent. They should also admit the incongruity of finding few fossils in a marginal marine setting that supposedly existed for many millions of years.

Since fossils are absent, the interpretation of the "Tertiary" strata near Americus, Georgia, must rest upon the sedimentary features which reflect the paleohydraulic conditions of deposition. Since those indicate high energy and imply short timeframes for deposition, the young-Earth Flood framework provides a superior model for interpreting these strata. The size and extent of the sedimentary features and lithologic changes, indicate that these strata formed by aqueous deposition in a setting with larger scale and higher energy processes than those proposed by uniformitarians.

Acknowledgments

I thank Emmett Williams, Jerry Akridge, and John Reed for their very helpful comments. As always, I thank my wife Susan for allowing me the time and opportunity to research and write this article for the glory of our Lord Jesus Christ. Any mistakes that may remain are my own. Glory to God in the highest! (Prov. 3:5–6).

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Book Review

Debating Design from Darwin to DNA

William Dembski and Michael Ruse, editors

Cambridge University Press, Cambridge, 2004, 408 pages, $45.00.

Intelligent Design (ID) continues to attract attention from various critics in the origins controversy. In this unique volume, three groups debate design with advocates of ID. The three groups are broken down into Darwinists, those who believe in complex self-organization, and theistic evolutionists. Their arguments sometimes are forceful and a few times even seem cogent. ID advocates answer their critics in the last part of the book and in my estimation do a superb job. It is a credit to Cambridge University Press for publishing the debate from various positions. However, the book is unbalanced in that a fifth part of the book should have been reserved for young earth model creationists (YEMs), who are regularly criticized by all except the ID people.

The book begins with an introductory chapter by the editors William Dembski and Michael Ruse summarizing each chapter. They settle the claim by evolutionists that ID should be publishing in standard science journals if they want credibility. The editors flat out state that this cannot happen (p. 3). In fact it is common practice for journal editors to refuse to publish letters that explicitly defend ID (p. 45). Of course, YEMs have known this for a long time. It is good to get the bias out in the open and hopefully evolutionists will quite using the claim of failure to publish to dismiss both ID or YEM.

The book's first section shows that the Darwinist position hasn't changed much over the years. They still believe the same old "just-so stories" of evolution, and that evolution is controlled by random mutations and natural selection. Natural selection is faithfully believed to be the great overcomer of pure chance. They proclaim evolution to be a fact. Ruse believes that David Hume demolished the argument from design long ago. There is the assumption that microevolution leads to macroevolution and the difference between the two is a matter of time, although there is no evidence of this. The claim of inept design is trotted out occasionally as evidence for evolution and not design. And of course, many also claim that evolution is not anti-Christian. Evolutionists love to parade compromising theologians as examples of how evolution and creation can be compatible. I wonder what the atheistic and agnostic evolutionists, who control academia, really think behind closed doors about these theologians?

The Darwinists are unanimous that ID is not science, or at best it is bad science. They further state that ID is an argument from ignorance, and that we need to give "science" time to solve the many origin mysteries. Some claim that ID needs to be excluded because it is "stealth creationism," and that creationists "…never take even the first step toward developing a positive theory of their own" (p. 105). They claim ID has failed to develop a scientific research program or make predictions. Furthermore, the Darwinists criticize ID for *not* taking a stand on the age of the earth. In keeping with the common Darwinists ad hominem arguments, one whole chapter by Robert Pennock is a diatribe against Stephen Meyer. Pennock tries to make a case that human dignity and morality generally do not depend upon man being created in God's image (p. 7). He uses the genetic fallacy, attacking supposed motives while avoiding the evidence, to try to discredit ID. A common trend I have noted with those who criticize ID is that they rarely consider the ID arguments in depth.

Although accusing ID of using rhetoric because of Behe's mousetrap analog, I found that most of the Darwinists arguments are themselves rhetorical. Only Ken Miller seemed to offer significant evidence against ID in his pretentious chapter titled "The Flagellum Unspun, '*The Collapse of "Irreducible Complexity.*'" Miller claims that evolutionists have addressed the issue of how evolutionary mechanisms can increase biological information (p. 85). He states that a subunit of the 40 or so proteins that code for the bacterial flagellum, the showcase for ID, has another function in producing a "type III secretory apparatus," which is a nasty device that allows a bacterium to inject toxins through cell walls. Since part of the proteins of the flagellum have a function in another process, Behe's claim of irreducible complexity is falsified, according to Miller. Therefore, ID is a failure because of this example and several others. Evolutionists love Miller because he is one of their favorite churchgoers who adores Darwinism. Michael Ruse has this to say about him in the introduction: "Note that Miller explicitly asserts that his naturalistic position is more theologically satisfactory than that of his opponents." There is great confusion in the Church.

Against the confidence that Darwinists claim to have every problem of origins either solved or well on its way of being solved, those who advocate complex self-organization admit in the second part of the book that all is not well, mainly with the origin of life. Self-organization is the idea that there is an inherent tendency for nature itself to become more complex with time just from physics and chemistry without the aid of natural selection or at best only a modest contribution from natural selection. This idea seems to be gaining adherents. However, they agree with the naturalist that a naturalistic mechanism is still needed for origins. Complex self-organization seems to be the category some scientists jump into when they discover that Darwinism really cannot explain much (chapter 11). James Barham admits:

> There has simply not been enough time since the Big Bang for even a single protein molecule to be created in this way with any reasonable probability, much less an entire cell—much less the whole inconceivable complex, functionally integrated organic world we see around us. If organisms were literally machines, they would indeed be miraculous—on this point, the Intelligent Design critique of Darwinism is perfectly sound (p. 216).

Stuart Kauffman seems to be the imaginative and excitable leader of the group who believe in self-organization. Although he concedes that these scientists don't have a process for general biology, they do have computers that can simulate the origin of life. But he is honest enough to admit that all his work is just a beginning, and that scientists do not understand the core of life (p. 152). Neither do they understand the emergence of novel functionalities (p. 155). He even states that no one understands evolution (p. 166). The other contributors to this part not only criticize ID but also criticize the Darwinists for their 'hyper-adaptation' model that ascribes everything to natural selection. Two of the participants in this group are supposed to be Christians who believe that ID *limits* God (p. 185).

Physicists Paul Davies is a critic of strict Darwinism (p. 8). He delves into the Second Law of Thermodynamics which he states is on solid ground. Nevertheless, the information of the universe has somehow increased. He supports the idea that there must be some *law* of increasing complexity to overcome the Second Law. He further states that there is no observational evidence of the cyclic universe (pp. 194-195) and that the inflationary hypothesis in some Big Bang models does not solve the low entropy problem.

The third part of the book is dedicated to theistic evolutionists. One can easily see that this group gets themselves into a muddle by not taking the Bible seriously as God's revealed word. It is clear that Genesis 1-11 is historical narrative and should be taken straightforward, like other historical sections of Scripture. Because theistic evolutionists compromise, they bow the knee to "science" and naively believe that Darwinism has been proven true. They will admit to much materialist ideology in evolution (p. 229). Some of them sing of the glory of evolution in creating. They even try to find some high theological, fuzzy-love reason why death and suffering are natural consequences of the privilege of evolving (pp. 258-259). These writers are uniformly opposed to ID and one wonders why? John Haught claims that ID is a "science stopper," and that ID postulates a god-of-the-gaps. Keith Ward says that ID "…would put God too directly into His creation" (p. 10). Michael Roberts faults ID for not dealing with the age of the earth issue.

Advocates of ID have the last say in Part Four. Apparently, participants did not have access to each other's articles, but I would conclude that Dembski, Bradley, Behe, and Meyer adequately answer most of the criticisms. Debmski and Behe summarize their major points for why ID should be included in science. They point out Miller's mistake on the claim that some of the proteins for the bacterial flagellum are used for another purpose. This is no problem and does not falsify ID because natural selection supposedly must fill in the details to arrive at a flagellum, and that natural selection can select only for preexisting functions (pp. 324–325). Only with intelligence can useful subunits be co-opted to be used in a more complex function. Besides the proteins in the type III secretory system in some bacteria are *not* identical to those found in the flagellum (p. 360). Behe also shows how Miller's claim that the mousetrap is not irreducibly complex is "verbal tap dancing":

> Kenneth Miller actually claimed…that a mousetrap isn't irreducibly complex because subsets of a mousetrap, and even each individual part, could still "function" on their own. The holding bar of a mousetrap, Miller observed, could be used as a toothpick, so it still has a "function" outside the mousetrap. Any of the parts of the trap could be used as a paperweight… (p. 359).

This example reinforces Behe's observation that Darwinists *cannot or will not* recognize difficulties for their theory (p. 364). It is as if a great blindness has overcome them.

With Debmski's explanatory filter he can rule out the idea of evolutionary 'baby steps' for forming complex structures. Mount Improbable, a term employed by Richard Dawkins to claim natural selection can create complex structures by baby steps, is sheer on *all* sides. Darwinists, therefore, do not have a viable mechanism in natural selection; there is no easy way up Mount Improbable. No wonder ID is a lightning rod for Darwinists. Furthermore, ID appeals to what is known and most probable, not to the *unknown or future research*, a common appeal by evolutionists when stuck.

Walter Bradley gives a cogent argument that the Second Law is strongly against Darwinism. He further states that Kauffman's model is just a simplified computer program. He makes a case that Prigogine's non-equilibrium ideas are trivial for explaining the specified complexity of living organism. All self-organizational schemes are fatally flawed (pp. 346–348).

Stephen Meyer uses the Cambrian explosion to show that Darwinism not only fails in explaining the origin of life but also cannot produce the many novel genes, proteins, and structures demanded by the Cambrian explosion. Furthermore, there are few if any claimed ancestors to this huge increase in information. He further makes the point that Kauffman's popular computer model *starts* with information, so begs the question.

I noticed that many of the critics of ID have a theological problem with the existence of evil and suffering. They seem to have an ax to grind and commonly accuse God of inept creating. Even the theistic evolutionists are preoccupied with this problem, although they attempt to smooth it over with fuzzy theological ideas. It is because they don't take Genesis 1–11, especially Genesis 3, seriously that they are in a hopeless muddle. The theistic evolutionists also have the problem that they also undermine the New Testament, which reinforces the Old Testament teaching that Adam's sin brought death to man and animals.

The ID critics seem to misunderstand science and assume evolution is really science, and that origins automatically must be explained naturalistically, or all questions of origins must use "methodological naturalism" (p. 134). The theistic evolutionists display great faith that evolution has been proven true by "science." Many of the critics are guilty of the genetic fallacy. We can thank ID advocate Angus Menuge for pointing out that the genetic fallacy is unreasonable and designed to shut off discussion. It is also interesting that the critics never seem to apply the genetic fallacy to themselves.

One ID critic tried to bait the ID advocates to deal with the question of the age of the earth and to challenge young earth creationists. The ID advocates remained steadfast and did not get involved in this issue. It is a good thing, I would say, because they are bound to get themselves into deep trouble since most believe in an old earth and a non-global Flood. They limit themselves to biology, the philosophy of science, and criteria to recognize design. In these goals, they are doing an excellent job of inserting their wedge into academia. Few of the ID advocates are really qualified to deal with the age of the earth and geology.

Despite the excellent arguments of the ID advocates, I hope they one day examine the questions of the age of the earth, Flood geology, and the authority of Scripture. Although they may not be able in a university setting to interject these concepts into "science," those ID advocates that claim to be Christians should become more consistent in their stand. ID advocates marvel at the opposition they are receiving on a concept so basic as the evidence for intelligent design. If they think about it they just might discover that strong deception runs extremely deep, and the same commitment to naturalism is also behind the concepts of the old earth and universe, a local Genesis Flood, and a non-literal view of Genesis 1–11. The book provides much insight into the various factions in the origins debate but must be read with caution and discernment.

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CO_2 Gas Well Effluent Analysis

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Abstract

Radiocarbon is found throughout the geological record, thus indicating a young earth. This research expands that information base by sampling the carbon dioxide in four of the five major CO_2 gas fields in the USA, and performing isotopic analyses. The data is consistent with the young earth creationist paradigm and provides additional incentive to investigate the isotopic composition of the earth's crustal gases.

Introduction

This paper investigates another piece of the origins puzzle. It is an attempt to provide a partial answer to the question: *Is there still radioactive carbon-14 in* all *carbon compounds in the geological record?* Since creationists believe that the Bible is the truthful revelation of God and His work, then we who believe in a recent creation would expect to find detectable carbon-14 in naturally occurring carbon dioxide well gas because of the relatively short carbon-14 half-life of 5730 years. This work experimentally verifies detectable carbon-14 and the amount may suggest whether the carbon may be of flood origin. Evolutionists claim that high pressure gases in the earth's crust (natural gas, carbon dioxide and noble gases) are trapped in rock impermeable enough to hold the reservoirs for many millions of years (Ballentine et al., 2001) Thus, they assume carbon dioxide gas as well as natural gas extracted from anywhere within the Mesozoic and Paleozoic record to be totally devoid of carbon-14. One reasonable explanation for the presence of the radiocarbon is flood deposition of organic material and the subsequent degradation thousands (not millions) of years ago.

Background

Examination of an aeronautical sectional map for remote private airstrips in eastern New Mexico revealed a location near Bueyeros labeled "CO_2 Gas Plant."

I wondered, "What in the world is a CO_2 gas plant doing in the hinterlands of northeastern New Mexico?" My perception of a CO_2 gas plant was a dull gray dingy building by the railroad tracks with a fading "Dry Ice" sign on top.

Of the six major CO_2 gas fields in the world, five are in the USA. Four of them are within easy driving distance of my home in Albuquerque. They are the Bravo Dome field at Bueyeros, NM; the Sheep Mountain field at Gardner, CO; the McElmo Dome field at Cortez, CO; and the St. Johns field near St. Johns, AZ. The fifth field is the NE Jackson Dome in Mississippi and the sixth is the Dodan field in Turkey.

In three of the four fields of interest to this investigation, the producing strata commonly sit just above the Precambrian. All the fields are characterized by northwest to southeast oriented anticlines. Furthermore, all four fields are immediately adjacent to volcanic uplifts. Sheep Mountain itself is of volcanic origin. Cinder cones and lava flows sitting atop portions of the St. Johns field are common. The McElmo Dome field wells are within a radius of five to twenty miles north of the Ute Mountain laccolith. The Bravo Dome field is a southeast tending extension of the Sierra Grande uplift. It also has volcanic intrusions. An example is the Black Hills six miles east of the Mitchell #16 well sampled in this work. The Black Hills and the lava covered Ute Creek Mesa are visible southern extensions of the large Sierra Grande uplift. Photos of gas well sites are shown in figures 1 through 4.

Curiosity led me to request a visit of the Bueyeros facility. No one at the plant could answer the question, "How did pure CO_2 get down there in the strata in first place?" Ron Broadhead of the New Mexico Bureau of Mines and Mineral Resources Geological Survey has stated, "The

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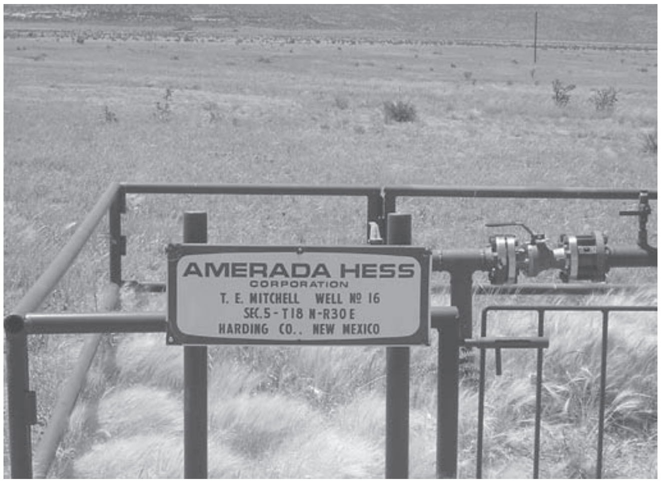

Figure 1. Bravo Dome Well Site (Mitchell #16) looking west. Sample point is the vertical pipe with valve on the far right.

Figure 2. St. Johns Field CO_2 gas well sampling

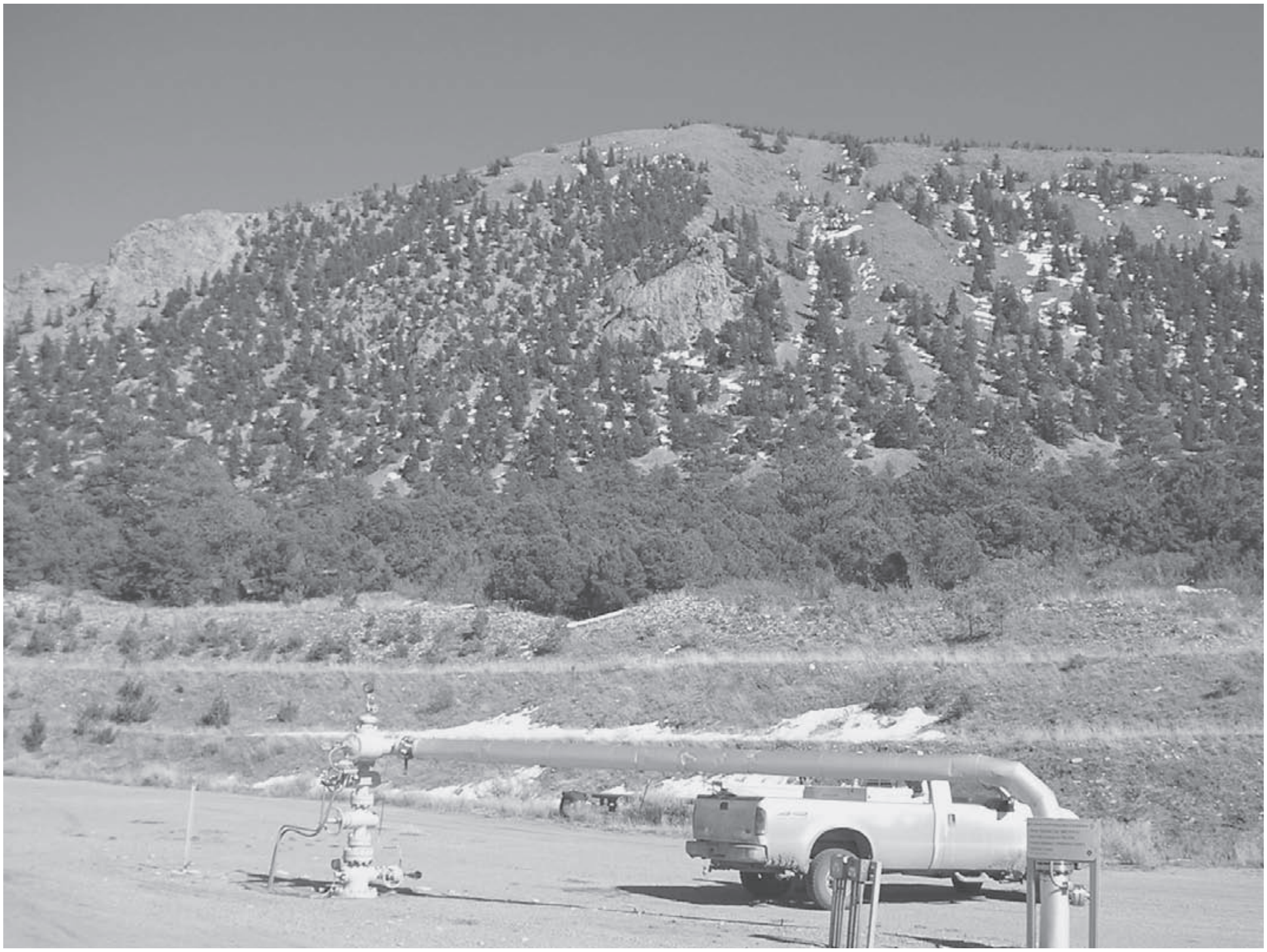

Figure 3. Sheep Mountain Field CO_2 gas well site. Little Sheep Mountain in the background. Many wells are slant drilled from one location.

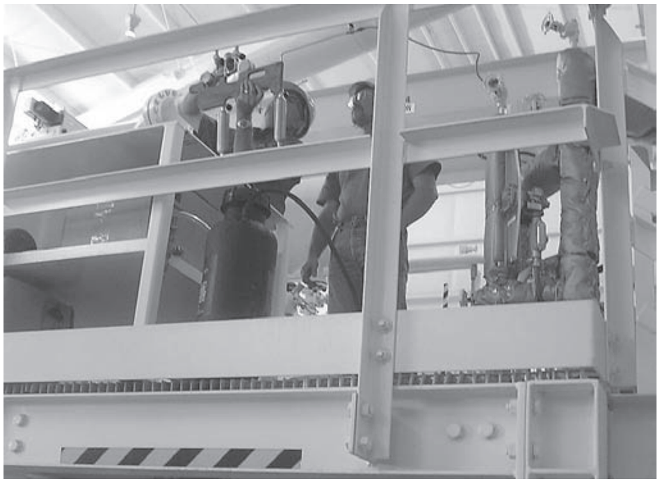

Figure 4. CO_2 gas sampling inside the Hovenweep facility at the McElmo Dome.

source of CO_2 gases encountered in northeast New Mexico is enigmatic" (Broadhead, 1993).

Indeed, the origin of the CO_2 gas has puzzled many investigators. The possible sources are: (1) thermal decomposition of carbonates by contact metamorphic processes, (2) carbonate dissolution linked to silicate hydrolysis, (3) bacterial degradation of organic matter, (4) bacterial hydrocarbon oxidation, (5) migration directly from intrusive igneous rocks, and (6) migration of juvenile CO_2 gas from the mantle and crust (Cappa and Rice, 1995).

Radiocarbon (Carbon-14)

Recent creationist work (Baumgardner et al., 2003) has shown the same average amount of ^{14}C is found in coal in three distinct portions of the stratigraphic record (Eocene, Cretaceous, and Pennsylvanian) indicating that the coal was laid down at the same time, thus confirming the young earth creation-flood model. The mean value of the ^{14}C/C ratio in percent modern carbon (hereafter referred to as pmc) for their samples was 0.247. That mean value compares closely with 0.292 pmc value obtained from the compilation of ^{14}C data from every portion of the Phanerozoic record. The mean value of non-biological Precambrian samples was 0.062 pmc. Subsequent work (Baumgardner, 2004. Personal communication) has shown the presence of ^{14}C in diamonds. The mean value of the ^{14}C/C ratio for the diamonds is 0.121± 0.021 pmc. Thus, if the ^{14}C/C ratio for the CO_2 gas samples obtained in this work exceeds 0.2 pmc, the source would most likely be carbon in rocks deposited in the Flood.

Four values for the ^{14}C/C ratio have been reported specifically for carbon dioxide gas, 0.077 pmc (Beukens, 1993), 0.12 pmc (Aerts-Bijma et al., 1997), 0.17 pmc (Gulliksen and Thomsen, 1992), and 0.21 pmc (Grootes et al., 1986). In all cases, the gas samples were derived from the combustion of natural gas and were used in efforts to calibrate their respective Accelerator Mass Spectrometer (AMS) devices. However, all these values are well above instrument resolution thresholds and beyond what is normally expected as "contamination" error. Thus, they have some carbon-14 present intrinsic to the samples. There have been no carbon-14 measurements of naturally occurring CO_2 well gas reported in the scientific literature. The sources for the CO_2 gas sample sets in this work are shown in Table I. The West Bravo Dome field gas sample taken from the Mitchell #16 well is a dry gas sample (no water in the formation). All the other samples were taken from strata where water was present in the gas.

The Stable Isotopes

Investigators examine the values of the stable isotopes of carbon and oxygen, δ^{13}C and δ^{18}O, to determine the origin of the items (rocks, gases, artifacts, etc.) that contain these isotopes. The usual standard for stable carbon isotope, δ^{13}C, is taken from the fossil belemnites of the Cretaceous Peedee Formation of South Carolina, abbreviated "pdb" and is measured in parts per thousand represented by the symbol "‰" (Krauskopf, 1979). Since the previously

Table I. CO_2 gas sample set sources

Set #	Field	Stratagraphic Formation	Production Depth
1, 2	Bravo Dome	Permian, Tubb sandstone (1)	2950 ft.
3	St. Johns	Permian-Supai, Big A Butte (2)	1600 ft.
4	McElmo Dome	Mississippian, Leadville limestone (3)	8500 ft.
5	Sheep Mtn.	Cretaceous, Dakota sandstone (4)	4450 ft.

Table I references: (1) Broadhead, 1987. (2) Rauzi, 1999. (3) Gerling, 1983. (4) Roth, 1983.

measured δ^{13}C values of Bravo Dome CO_2 gas (-3.9‰ pdb and -4.1‰ pdb) were nearly identical with the Mid Ocean Ridge Basalts (MORB) values (-3.8‰ pdb), Staudacher (1987) concluded that the origin of that CO_2 gas was the earth's upper mantle; i.e., juvenile magmatic. Indeed, there is a strong argument for this position when one compares Staudacher's values with those obtained from volcanic parental sources that ranged from -2.29‰ to -4.16‰ pdb with an average of -3.2‰ pdb (Gerlach and Thomas, 1986) and -2.7‰ to -3.4‰ pdb (Baubron et al., 1990). Similar δ^{13}C values previously reported for high purity McElmo Dome CO_2 gas were between -3.77‰ and -4.43‰ pdb (Cappa and Rice, 1995). However, analysis of the associated well drill core samples gave values similar to that of calcite (-0.64‰ pdb). Although the δ^{13}C values were essentially identical to Bravo Dome, MORB, and volcanic gases deemed juvenile magmatic, the origin of the McElmo Dome CO_2 gas was thought to be the high temperature thermal decomposition of carbonates in the producing dolomite layers of the Leadville limestone formation which produces the CO_2 gas (Cappa and Rice, 1995). The usual range of values for marine carbonates is -1‰ to +2 ‰ pdb and -2.2‰ to -7.7 ‰ pdb for freshwater carbonates (Faure, 1986). Veizer and Hoefs (1976) collected 1931 data points for carbon-13 in sedimentary carbonate rocks. The majority of the data fell within the range of -4‰ to +4‰ pdb. No δ^{13}C values have been reported for either the St. Johns field or the Sheep Mountain field. The δ^{13}C value for coal is -25‰ pdb (Faure, 1986), the value range for diamonds is -2.0 to -10‰ pdb (Faure, 1986). The δ^{13}C value for kimberlites is -4.7‰ pdb (Faure, 1986). The range of δ^{13}C values given above is shown in Figure 5. Thus, considering the range of the δ^{13}C data and the differing interpretations, it is no wonder that the source of the CO_2 gas is considered enigmatic. More information is needed to try to solve the source puzzle.

The stable oxygen isotope, δ^{18}O, value for seawater (the standard) is zero, (standard mean ocean water, abbreviated as "smow"). The value for meteoric water varies from -25‰ to 0‰ smow. The mantle has a value of about +6‰. Air has value of +23.5‰ and atmospheric CO_2 is +41‰. Detrital sedimentary rocks have a range of +9‰ to +18‰. (Wickham and Taylor, 1990). Consistent with their thorough compilation of δ^{13}C data, Veizer and Hoefs (1976) compiled 2011 data points for the oxygen-18 isotope for sedimentary carbonates. The majority of the data fell within the range of +20‰ to +30‰ smow as also reported by Wickham and Taylor (1990). The usual value for calcium carbonate at 25°C is +28.6‰ (Krauskopf, 1979). The presence of the δ^{18}O isotope in the CO_2 is usually indicative of an exchange between the CO_2 and ground water. The issue then becomes the source of the water, meteoric or magmatic? (Krauskopf, 1979) It can also be a product of the

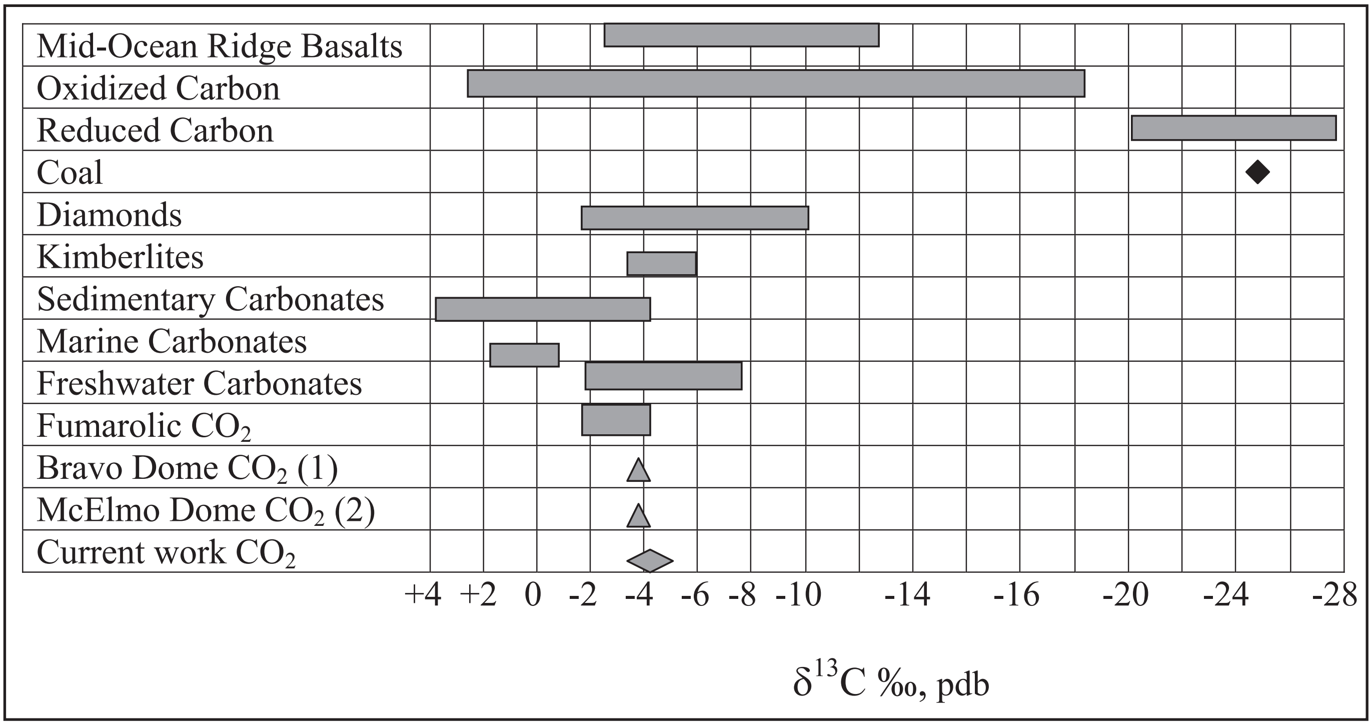

Figure 5. Range of Carbon–13 values for various rocks and gases.

References: 1. Staudacher (1987) 2. Cappa & Rice (1995)

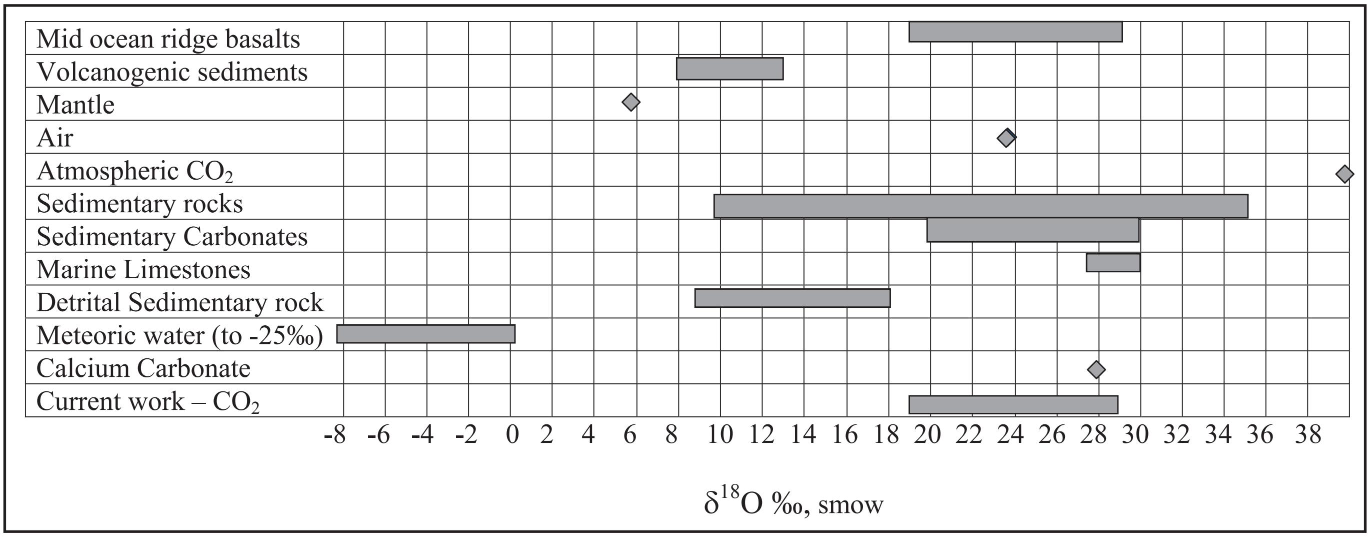

Figure 6. Range of Oxygen–18 values for various rocks and gases.

wollastonite formation and other metamorphic reactions. Common values for δ^{18}O for rocks such as sandstones, greywackes, arkoses, and volcanogenic sediments are +8 to +13‰ (Taylor, 1974). For sedimentary rocks the values range from +10‰ for quartz sandstone up to +35‰ for chert (Faure, 1986) and +28‰ to +30‰ for marine limestones (Faure, 1986). Of initial interest to this work is that done on Mid-Atlantic Ridge basalts containing CO_2 rich vesicles. Both δ^{13}C and δ^{18}O values were obtained from a lava tube source. The values obtained via acid extraction were -3.5‰ to -12.7‰pdb and +19.4‰ to 29.2‰ smow respectively. Similar values obtained by crushing were -8.0‰ pdb and +24.1‰ smow respectively (Pineau et al., 1976). No δ^{18} O values have been reported previously for any of the four CO_2 gas fields examined in this work. The range of values for the oxygen isotope is given in Figure 6. With all the possibilities for interpretation of the stable isotopes, Faure (1986) wrote, "However, the δ^{13}C as well as δ^{18}O values of carbonate rocks may be altered after deposition making such interpretations uncertain" (p. 498).

Therefore, some pursue analyses of noble gas isotope data for more insight. Such analyses seem to indicate a mantle source for the Bravo Dome well gas (Ballentine, 1997). Some noble gas isotopic analyses even point, perhaps unknowingly, to a young earth (Ozima et al., 1985).

Description of Sampling Apparatus and Procedures

A sampling system was constructed using stainless steel parts rated at 1800 psi. (Herein psi represents the actual gauge pressure.) It features a sampling port through which the CO_2 enters the system. The system has two 300 cc cylinders. One is used as a pressure surge damper and the second is used for pressure control and a container for additional sample gas. The gas samples sent to the University of Arizona Accelerator Mass Spectrometer (AMS) laboratory were in two 10 cc stainless steel cylinders. The system has a high pressure gage rated to 800 psi, and a low pressure gage which has a range of vacuum to 30 psi. The sampling system is shown in Figure 7.

Prior to going to the field, the system was filled with helium at 42 psia (absolute, not gauge pressure). It was then pumped down to 1.2 psia with a vacuum roughing pump (Becker Model VT 4.4). It was then filled and purged 18

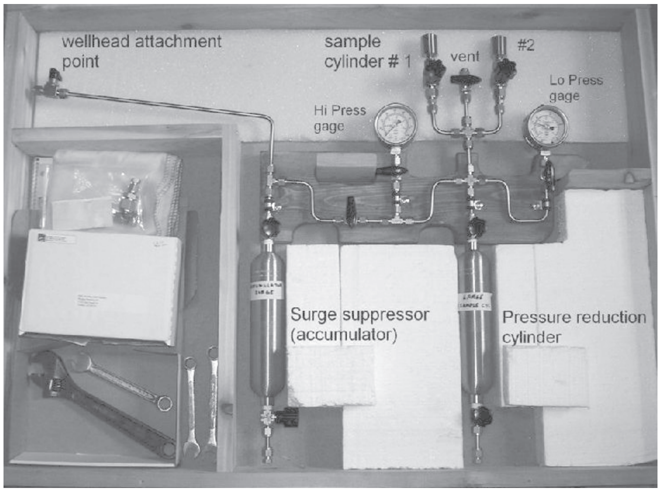
wellhead attachment point
sample cylinder # 1
vent
#2
Lo Press gage
Hi Press gage
Surge suppressor (accumulator)
Pressure reduction cylinder

Figure 7. CO_2 Gas Sampling System in the carrying case.

times to remove all the initial air in the system. The volume was 656 cc. The mass reduction factor was 35.2 for each cycle. After 18 cycles there would have been less than one ^{14}C atom in the system. The system was pumped down again to 1.2 psia and all valves were closed. The system was then taken to the field in its carrying case.

Prior to attaching the system to the wellhead, the source valve was opened and some gas was vented to clear the wellhead port. The sampling system was attached to the wellhead port. The system input valve was opened and then the valves on either side of the surge suppressor cylinder. The gas was cycled through that side of the system nominally four times with the source system valves fully open. The valves to the high pressure gage were opened and the value recorded. The vent was then opened and a continual flow was established. The vent was closed and the valves for the two small 10 cc sample cylinders were opened. The sampling system valve was then closed, as was the valve ahead of the high pressure gage, thus isolating the left hand side of the system. If the pressure was greater than 160 psi, the vent was slowly opened to drop the pressure to that value. The vent was closed once again and the valve to the pressure reduction cylinder was opened. The pressure dropped to 6 psi in the right hand side of the system and the small cylinder valves were closed. All other valves were closed. The sampling system was detached from the wellhead. The small cylinders were detached from the system and capped.

These cylinders were then mailed to the University of Arizona AMS lab. The U.S. Postal Service allows the shipment of small gas cylinders if they are less than 10 psi. Once the small cylinders arrived at the AMS lab, they were attached to a vacuum system and the air that was between the valve and cap was pumped out. A small sample was then removed for stable isotope analysis. The remainder was then used to make the graphite targets for the AMS instrument. The usual turnaround time for the lab is three months. Four sample sets each were submitted in January and April, 2004. The final sample set of two was submitted in late May, 2004. It was a repeat of the first Bravo Dome gas sample that was obtained in 1999. The first Bravo Dome samples were transferred into the small cylinders that had only been through four purge and fill cycles. The second Bravo Dome sample set was obtained in the same fashion as the other field samples; i.e., after the system had been through 18 purge and fill cycles. Two separate samples of the same gas provide redundancy and contingency should there be an error in one of them.

Results

The physical characteristics of the well gases sampled at the wellhead in the four CO_2 gas fields are shown in Table II. The exception was the McElmo Dome where the sample was taken downstream of a dryer. The wellhead pressure was too high (800 psi) for a sample to be safely obtained directly from the wellhead. All samples were taken from producing (flowing) wells.

Two identical samples from each of the four CO_2 gas fields were sent to the NSF-Arizona AMS laboratory in Tucson. The samples were analyzed for their content of $\delta^{13}C$, and $\delta^{18}O$, and for the $^{14}C/C$ ratio. The Bravo Dome sampling was repeated because the technique for the first two samples was different than those for the other three fields. Thus, another set was acquired using the identical system preparation and sampling technique to better assure consistency in the data foundation. The results are shown in Table III. As noted in Table III, the isotopic mean values are $\delta^{13}C = -4.053‰$ pdb, $\delta^{18}O = 23.44‰$ smow, $^{14}C/C$(uncorrected) = 0.636 pmc and $^{14}C/C$(corrected) = 0.446 pmc

Discussion

The values in the four data sets for the stable isotopes, $\delta^{13}C$ and $\delta^{18}O$, fall nicely in the range of sedimentary carbonates, -5‰ pdb and +20 to +30‰ smow. On the other hand, the values also compare closely with CO_2 gas data obtained

Table II. Well Gas Characteristics

Field	Well sampled	Pressure psig	Temp. °F	Purity, %	Impurities
Bravo Dome	Mitchell #16	385	50	99.8	N_2, CH_4, noble gases
St. Johns	10-22 State	510	50	~90	N_2, H_2O, He, A, CH_4
McElmo Dome	Hovenweep	628	49	92	N_2, H_2O, He, A
Sheep Mtn.	3-4-0	160	38	98.3	N_2, H_2O, CH_4

Table III. Field Sample Isotope Values

Field Sample	Date sampled	Date analyzed	Mass mg	$\delta^{13}C$, PDB	$\delta^{18}O$, SMOW	$^{14}C/C$, pmc uncorrected	$^{14}C/C$,pmc corrected
Bravo Dome #1	5/29/01	2/24/04	0.84	-3.87	19.063	**0.83±0.1**	**0.52±0.1**
Bravo Dome #2	5/29/01	2/24/04	0.80	-3.879	19.078	**0.61±0.1**	**0.31±0.1**
Bravo Dome #3	5/28/04	8/24/04	1.15	-4.02	19.78	0.19±0.1	<0.20
Bravo Dome #4	5/28/04	8/24/04	1.29	-4.27	19.15	0.25±0.1	<0.20
St. Johns #1	1/09/04	2/24/04	1.45	-4.277	24.828	0.98±0.1	0.67±0.1
St. Johns #2	1/09/04	2/24/04	1.45	-4.278	24.050	0.46±0.1	<0.36
Sheep Mtn #1	3/18/04	6/22/04	**0.56**	-3.356	29.109	**1.53±0.11**	**1.21±0.11**
Sheep Mtn #2	3/18/04	6/22/04	1.37	-3.401	28.629	0.42±0.1	<0.31
McElmo Dome #1	3/30/04	6/22/04	1.37	-4.583	25.379	0.66±0.1	0.35±0.1
McElmo Dome #2	3/30/04	6/22/04	1.37	-4.594	25.335	0.43±0.1	<0.33

Notes:

1. The low mass for Sheep Mtn #1 compared to Sheep Mtn #2 suggests loss of mass in handling and possible contamination.
2. The marked difference between the Bravo Dome #1 & #2 and Bravo Dome #3 & #4 $^{14}C/C$ data sets is largely due to the increased number of purge and fill cycles prior to sampling the latter.
3. The isotopic mean values are $\delta^{13}C$ = -4.053‰ pdb, $\delta^{18}O$ = 23.44‰ smow, $^{14}C/C$(uncorrected) = 0.636 pmc and $^{14}C/C$(corrected) = 0.446 pmc.

from vesicles in mid-Atlantic ridge lava tube basalts (-3.5 to -12.7‰ pdb for $\delta^{13}C$, and +19.1 to +29.2‰ smow for $\delta^{18}O$) by Pineau et al. (1976) cited earlier. Therefore, without the ^{14}C data, one could just as well conclude that the CO_2 source is juvenile magmatic.

Not surprisingly, the $^{14}C/C$ values show a significant amount of ^{14}C in the well gas. This is especially remarkable when one considers that the AMS lab subtracted a "contamination or background correction" factor on the order of 0.30 pmc from the $^{14}C/C$ raw data values. Doing such is standard practice and is in line with the fact that the AMS lab quotes a pmc value of 0.25±0.1 for their "carbon dead" CO_2 gas which is derived from natural gas. The $^{14}C/C$ values reported as a less than (<) value were outside the uncertainty bound of the AMS instrument of approximately 0.6 pmc. Thus, if a measured value is 0.46±0.1 as is the case for the St. Johns #2 sample, then the lab reports a value that is 0.1 pmc less than the raw data value. As shown in on the histogram in Figure 8, the mean value for the $^{14}C/C$ data is 0.446 pmc for all data points and 0.361 pmc if the Sheep Mountain #1 sample is not included. That sample was deemed spurious due to low sample mass (41% of the #2 sample) and a definite possibility of a handling and contamination problem. The differences between the first and second data sets from the Bravo Dome also indicate the possibility of slight contamination in the first set. Taking the value that best represents the entire data, 0.361 pmc, results in an uniformitarian age of 45,200 years using the convention of 5,568 year half-life for reporting age by ra-

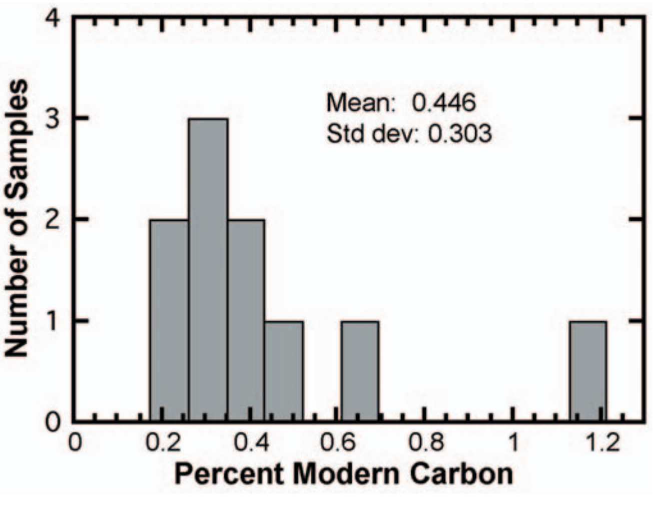

Figure 8. Distribution of ^{14}C values for the four CO_2 gas wells.

diocarbon dating labs. The $^{14}C/C$ values being in the range of flood deposit values (Baumgardner et al., 2003) indicate sedimentary rock sources for the CO_2. If the CO_2 source was juvenile magmatic CO_2 , it probably should have been on the same order as the $^{14}C/C$ values for diamonds (~0.12 pmc) and other Precambrian sources.

Consider the $\delta^{13}C$ values for coal, -25‰ pdb (Faure, 1986); and the values for diamonds, -2.0‰ to -10‰ pdb, (Faure, 1986), and -4.7±1.2‰ pdb for kimberlites (Faure, 1986). Clearly, the $\delta^{13}C$ values agree only for the very old diamonds and kimberlites, and not the Phanerozoic coal data. Yet the C^{14}/C ratios of this work are definitely more similar to those of coal than those of diamonds. Specifically the Bravo Dome #3 and #4 uncorrected values are quite similar to the Blind Canyon, Utah (Cretaceous period) and Lykens Valley, Pennsylvania (Pennsylvanian period) uncorrected C^{14}/C ratios of 0.18 pmc and 0.214 pmc respectively (Baumgardner et al., 2003). The resolution of this seemingly discordant data follows.

Faure (1986) noted that the isotopic composition of carbon in the *oxidized* form (carbonates and CO_2 gas) differed markedly from that in the *reduced* state (graphite, carbides, and organic compounds). The *reduced* carbon is strongly enriched in ^{12}C and has $\delta^{13}C$ values between about -20‰ and -28‰ pdb, on the same order as that of coal. The *oxidized* carbon has distinctly different $\delta^{13}C$ values ranging from +2.9‰ to -18.2‰ pdb. Faure (1986) also noted that the difference in $\delta^{13}C$ values of coexisting CO_2 and CH_4 of fumarolic gases may be due to isotope fractionation associated with the equilibrium reaction:

$$CO_2 + 4H_2 = CH_4 + 2H_2O$$

Mixtures of CO_2 and CH_4 from steam jets had average $\delta^{13}C$ values of $\delta^{13}C(CO_2)$ = -3.74‰ and $\delta^{13}C(CH_4)$ = -26.74‰ pdb. The difference is: $\Delta(CO_2 - CH_4)$ = 23.00‰. This indicates an average equilibration temperature between 258°C and 328°C depending on whose fractionation factors are used. Thus, there is a distinct shift between the $\delta^{13}C$ values of CO_2 and CH_4 in fumarolic gases due to isotope fractionation at elevated temperatures. Similarly, if one takes the mean value of the $\delta^{13}C$ from the four CO_2 gas fields, -4 ‰ pdb, and compares it with the nominal $\delta^{13}C$ value of organic matter in sedimentary rock, -28‰ pdb (Faure, 1986), the fractionation shift is: $\Delta(CO_2 - C_XH_Y)$ = 24‰. That suggests a heating of the sediments in the temperature range of 240°C to 310°C occurred in the recent past.

From the creationist view, the current RATE work is advocating a significant increase in radioactivity (accelerated decay) at the time of the Flood. That, coupled with an antediluvian atmosphere that was rich in CO_2 and O_2, the sediments being heated and oxidized (further heat release) would account for the enriching shift of $\delta^{13}C(CO_2)$ values. Note once again that the four fields from which the samples were obtained are closely associated with volcanic activity. A model which includes the thermally induced enriching shift makes the $\delta^{13}C(CO_2)$ values compatible with the C^{14}/C ratios found in this work.

Conclusion

The CO_2 gas derived from the Permian, Mississippian, and Cretaceous geological strata is of recent origin and not the commonly accepted 100 to 350 million year timeframe. One possible source of the CO_2 is from the flood deposition of sediments and subsequent degradation of the organic material. The mean isotopic signature for this naturally occurring CO_2 well gas is $\delta^{13}C$ = -4‰ pdb, $\delta^{18}O$ = 23.4‰ smow, and $^{14}C/C$ = 0.36 pmc. This work provides additional evidence that the earth is indeed young as revealed in the Bible.

Acknowledgements

I thank the CRS Research Committee for the grant which financed this work. I also wish to thank Dr. John Baumgardner and Dr. Russ Humphreys for their encouragement in the course of this research plus Dr. Andrew Snelling and Dr. Jerry Simmons for their advice and suggestions concerning the preliminary manuscript of this work. Thanks also are due for the help of Mr. Eric Thornton of Ridgeway Arizona Oil Company, St. Johns, Arizona; Mr. Albert Sena of BOC Gases, Mosquero, NM; Mr. Rick Gersch of Kinder Morgan Energy, Cortez, CO; and Mr. Larry Nugent of BP America, Gardner, CO, in obtaining gas samples at their respective well sites. Finally, I thank my wife, Jeanette, who accompanied me into the field and enjoyed our times in the wilderness.

"Speak to the earth, and it will teach you," Job 12:8.

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Book Review

Red Earth, White Lies by Vine Deloria, Jr.

Fulcrum Press, Golden, CO, 1997, 271 pages, $16.95.

While visiting Wupatki National Monument near Flagstaff, Arizona, I picked up this very unusual book. It is a young-earth creationist book written from the viewpoint of a Native American. Vine Deloria, Jr. is a professor of history, law, religious studies, and political science at the University of Colorado in Boulder. Though his viewpoints may shake the foundations of evolution, he is not impressed with what he calls "fundamentalist Christianity." His reasons are outlined in the first chapter, *Behind the Buckskin Curtain*, where he shows that those who professed Christianity in the past, especially with their treatment of the Indians, did not demonstrate very much difference from others. Though he makes the common mistake of rejecting the validity of Christianity by evaluating its worst examples, it is evident that false doctrine and hypocrisy within the church have done much damage to Native Americans.

Deloria recognizes that a false dichotomy exists between the secular and spiritual, and this causes damage to Christianity as well as others who search for the truth. The advent of Darwinism destroyed the effectiveness of the message of Christianity and set up a secular academic world devoid of spiritual life. He gives many reasons to reject the orthodox evolutionary paradigm and speculates that the reason it has persisted so long is because at heart, scientists are "incredibly timid people. Many of them are intent primarily on maintaining their status within their university or profession" (p. 28).

In all of this, the oral traditions of Indians (he does not object to the use of this term) are basically ignored by Western thought, where indeed they may be parallel and give insights into the catastrophic origins of many of the geological features in America. Respect for non-Western traditions is difficult to achieve, and nonsensical theories concerning the origin of the Indians in America abound, though there is no corroboration with Indian oral tradition. One such academic myth is the Bering Strait land bridge theory, which he refutes in detail. Some Indian traditions talk about migration by boat, which most academics reject because of their belief that the Paleo-Indians were too primitive to build such craft. But that notion has been challenged by Thor Heyerdahl and others who have duplicated the migration of the Polynesians by boat. There are numerous physical problems and geographic barriers concerning the migration of people and animals across a land bridge. He also spends several chapters refuting the notion of Indians killing off the mega fauna leading to mass extinctions. He rather attributes this to catastrophic geologic events and cites the Indian oral traditions that describe these events.

The Indian view is that the world is alive. Though Vine Deloria is not a Christian, he argues that the Bible validates the Indian oral traditions rather than the other way around. I would say that both should be considered in the search for truth although modern academia favors naturalism. Deloria's impression is that evolutionists place the American Indian at the bottom of the human evolutionary scale along with other tribal peoples and this has led to many atrocities.

Deloria is somewhat familiar with the early writings of creationists and quotes extensively from Donald Patten's 1966 book, *The Biblical Flood and the Ice Epoch.* He favorably regards the ideas presented there. He rejects radioisotope dating and suggests a young world, though he might go back as far as 250,000 years for the age of the earth. Indian traditions talk about a white race, a mean-spirited, bearded people who fought the Salish, Sioux and Algonkians, and were subsequently driven northeast and across the Atlantic ocean. They also talk about giants and people who lived to be 200 years old.

The chapter on Geomythology and the Indian Traditions was particularly interesting and should be studied by creationists. According to the oral tradition of a very old Wishram woman, the Columbia River flowed underground west of The Dalles for a long distance through the Cascades, and the Indians would fasten their canoes together one behind the other and pray to the Great Spirit for guidance as they paddled through the long dark tunnel. Then, Mount Hood and Mount Adams quarreled, hurling fiery stones at one another, and the bridge collapsed. This event took place in the time of her grandfathers, which would have been about 1750–1760. Oral traditions also tell about the eruptions of Mount Hood, Mount Rainier and Crater Lake. Mount Rainier, according to tradition, moved away from the Olympic Mountains forming the Puget Sound. Also, the Three Sisters was once the tallest mountain in the area, reaching a height of 15,000 feet, but blew its top, leaving the three peaks that remain today. This tradition is verified by geological evidence, though geologists would not believe that the event occurred in historic times. A detailed Klamath story tells about the eruption and collapse of Crater Lake. Also the Hopi Indian legend of the eruption of Sunset Crater near Flagstaff was not regarded because it didn't match the traditional geologic dates, but now is given much more weight because the story matches the evidence.

Deloria also tells of Indian legends that corroborate the Bretz flood which carved the eastern scablands of Washington. From his own tribe's tradition, he tells of the Badlands of South Dakota being formed as the result of the Pennsylvanian coal beds catching fire, burning for many years. Finally, he talks about the many traditions and petroglyph sites that describe extinct creatures he believes to be dinosaurs. He also mentions the mythical "water panther" Me-she-pe-shiw found in many petroglyph carvings (p. 222), and believes this to be a creature much like the stegosaurus. One such site where drawings of this creature exist is the Sanilac Petroglyphs in Michigan's Thumb area. I recently visited this site, took pictures and have an article concerning this at http://www.rae.org/sanilac.html.

Deloria writes, "We are living in a strange kind of dark ages (sic) where we have the immense capability of bringing together information but when we gather this data, we pigeonhole it in the old familiar framework of interpretation, sometimes even torturing the data to make it fit" (p. 211). I believe Deloria's book should be required reading for creationists and the information he presents should be carefully considered.

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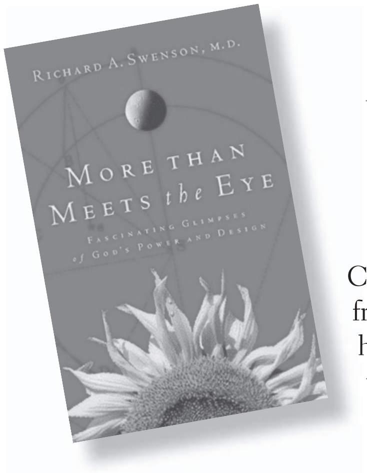

Book Review

More than Meets the Eye by Richard Swenson

NavPress, Colorado Springs, 205 pages, $12.00.

Consider just two sentences from this powerful book: "The human body is composed of ten thousand trillion trillion atoms—a number greater than the stars of the universe. In each person, more than a trillion of these atoms are replaced every one-millionth of a second" (p. 94). The fascinating content goes on like this page after page.

Author Swenson is a medical doctor with undergraduate training in physics. A *futurist*, he is an expert on the implications of societal change and also is a conservative Christian. I enjoyed his rationale for researching design in nature: "the sovereignty, power, design, majesty, precision, genius, intimacy and caring of an Almighty God…takes away our fear…It allows us to sleep at night and trust Him in the running of His own universe" (p. 15).

The following are further noteworthy book statements. The body has sixty thousand miles of blood vessels (p. 24). Due to atmospheric mixing, every breath we take contains 150 million molecules that were also breathed by Jesus Christ (p. 28). The capacity of the brain is…twenty-five million books, enough to fill a bookshelf 500 miles long (p. 40). The epidermis [skin] is completely replaced every couple of weeks; total bone replacement takes about nine years (p. 80). Over a lifetime, the scalp will produce nearly five hundred miles of hair (p. 82). The absorptive surface area of the small intestine equals that of a tennis court (p. 85). God can count to infinity backwards and recite the Encyclopedia Britannica in every known human language in a trillionth of a second (p. 97). All these ideas are expressed by author Swenson with interest, humility, and humor. I recommend this book for readers interested in technical aspects of the human body. There are thorough footnotes and an index.

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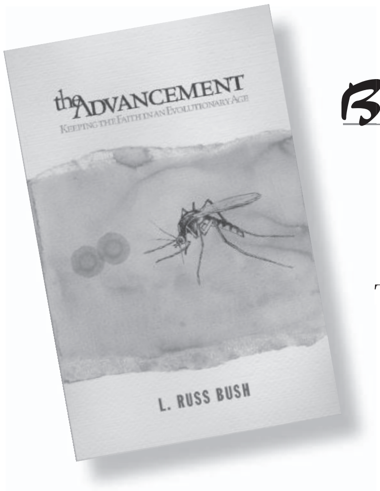

Book Review

The Advancement by L. Russ Bush

Broadman and Holman Publishers, Nashville, 2003, 148 pages, $20.00.

The author is academic dean and professor at Southeastern Baptist Seminary, Wake Forest, North Carolina. He is also past president of the Evangelical Theology Society. In this book Bush challenges postmodernism which he prefers to call *Advancement*. By this he implies a combination of technological progress and theological regress. This current religious trend includes a denial of absolute truth and universal ethics which Bush relates to scientific naturalism. The book's subtitle is "Keeping the faith in an evolutionary age."

I was happy to see Dr. Bush challenge open theism, also called process theology (p. 53). This view suggests that God does not know or control the future (xi). This theological error is an effort to excuse God from responsibility for war, human suffering, and evil. As the book of Job clearly shows, God does not need our defense, and we do not need a full explanation of such details.

Bush makes many good points for Creation. He contrasts survival of the fittest with survival of the faithful (p. 15). Bush does not challenge modern technology with its multiple advances. Instead, his target is the secularization and resulting impoverishment of science. The book is theologically heavy but is sound reading.

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Darwinism and the Deterioration of the Genome

Jerry Bergman*

Abstract

An evaluation of DNA/RNA mutations indicates that they cannot provide significant new levels of information. Instead, mutations will produce degradation of the information in the genome. This is the opposite of the predictions of the neoDarwinian origins model. Such genome degradation is counteracted by natural selection that helps maintain the status quo. Degradation results for many reasons, two of which are reviewed here: 1) there is a tendency for mutations to produce a highly disproportionate number of certain nucleotide bases such as thymine and 2) many mutations occur in only a relatively few places within the gene called "hot spots," and rarely occur in others, known as "cold spots." An extensive review of the literature fails to reveal a single clear example of a beneficial information-gaining mutation. Conversely, thousands of deleterious mutations exist, supporting the hypothesis that very few mutations are beneficial. These findings support a creation origins model.

Introduction

The primary basis of macroevolution is presumably the occurrence of mutations, which are accidental changes in the DNA. This includes both DNA that codes for protein and that which has other roles in the cell. This changed DNA can result in an observable change in the phenotype (the physical appearance) of the organism. These mutations ultimately provide the differences that are selected for (or against) by natural selection (Mayr, 2001; Wise, 2002). The critical importance of mutations in providing the raw material for evolution is widely acknowledged by Darwinists, and is almost universally mentioned in biology textbooks (Mayr, 2001). In the words of one of the founders of the modern neoDarwinian theory, and one of the most eminent evolutionists, Harvard professor Ernst Mayr: "Ultimately, all variation is, of course, due to mutation" (Mayr, 1967, p. 50). The primary architect of neoDarwinism was Theodosius Dobzhansky who wrote that "the process of mutation is the *only* source of the raw materials of genetic variability, and hence of evolution" (Dobzhansky, 1951, p. 385, emphasis added). Dobzhansky (1951) further concluded that "evolution is possible *only* because heredity is counteracted by another process opposite in effect—namely, mutation" (p. 25, emphasis added). The conclusion that mutations are the key to evolution is the basis of modern neoDarwinism (Mayr, 2001).

Other sources of variation, such as sexual reproduction, genetic crossing over, and transposition, primarily produce only rearrangements of existing information and do not create new genetic information. These other mechanisms of change yield phenotypic variations that will produce, at best, only a limited amount of microevolution. Therefore, the source of *all* genetic variety required for macroevolution ultimately is mutations.

One of the most commonly utilized illustrations to help understand the process of macroevolution via mutations was developed by the leading evolutionary biologist and Oxford professor, Richard Dawkins (1986). His example requires random variations of all, or almost all, of the nucleotides for neoDarwinian evolution to occur. This paper examines

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whether or not this general requirement is fulfilled.

The Dawkins macroevolutionary model actually helps to show why mutations that are *expressed* virtually always result in loss of information or corruption of the gene. Most all expressed mutations yield proteins that have reduced function, such as illustrated by sickle cell anemia. Some mutations, like adrenoleukodystrophy, cause a complete loss of function (Lewis, 2003). This result fits with Batten's report that most mutations are harmful and

> most of the remainder seem to have neither positive nor negative effect. Mutations that are actually beneficial are extraordinarily rare and involve insignificant changes. Mutations seem to be much more degenerative than constructive… (Batten, 2002, p. 163).

Three kinds of mutations can be distinguished—beneficial, neutral, or deleterious (Mayr, 2001). To be consistent, Mayr's terminology will be used in this paper, which argues that the long term result of mutations is the degradation, deterioration, or degeneration of the genome.

Dawkins' Weasel Analogy

Dawkins (1986) developed a computer simulation program called the "weasel analogy" to illustrate how Darwinian evolution works. The term "weasel analogy" refers to a line in Hamlet, *viz.* "METHINKS IT IS LIKE A WEASEL," which is the target sequence. Dawkins started with a set of English letters selected by random. His computer program then reproduced his starting string of letters to achieve a second generation, a third generation, etc. Each time that his computer ran the program, though, random changes were introduced (Dawkins, 1998). In each generation, the computer chose only those randomly changed letters that fit the target sequence. The letters that fit the goal letters are retained and not mutated again. This example was meant to simulate how natural selection might work to evolve a living organism, and the productive changes that can result from natural selection of simulated mutations (Spetner, 1997). The concept illustrates both the evolution of genes from preexisting genes and also from random sequences of DNA.

Dawkins' example has been widely cited in the literature, and many evolutionists have asserted that his computer analogy provides clear support for Darwinism. Raymo (1998), for example, argued that such modeling is a valid method of demonstrating evolution, and that:

> What seemed unlikely to Darwin, and seems impossible to creationists, has been shown to be quite reasonable by high-speed computer modeling. Not only reasonable, but, given the proven premises of random mutations and natural selection, virtually inevitable. Will successful computer simulations make any difference to creationist True Believers? Not likely. (p. 152)

Problems with Dawkins' Analogy

An evaluation of the literature and an analysis of the original data reveals many serious problems with Dawkins' mutation/selection model. A major problem is that the computer program contains human designed foresight that evolution does not possess. Intermediate word sets are chosen only because the program is designed to select for changes that match its predetermined goal. Many of Dawkins' rules are unrealistic, such as only non-goal letters are subject to mutation in each generation in order to reach the goal. They would not be selected by a reader who did not know the goal of the program. Many problems also exist with the mutation/selection basis of macroevolution, three of which will be covered in detail here because they demonstrate a major problem of neoDarwinism in nature.

One major problem is that this model does not include lethal mutations. Every single product of the program can survive and "reproduce" until the goal is reached. As a result, there is no limit to the "beneficial changes" available for selection, and every single change to each goal letter increases "fitness" and is thus selected for the next generation (Spetner, 1997). This model is totally unrealistic because most expressed mutations are deleterious and, as a result, the favorable mutations almost always "become swallowed in the flood of bad mutations" (Hoyle, 1999, p. 20). Hence, "only mutations of small effect are likely to be beneficial" (Bell, 1997, p. 56).

The triplet genetic code design is resistant to mutational changes in the gene product because a third base mutation will often result in the *same* amino acid when translated. Thus no amino acid change will occur in the protein that is produced. In these cases, natural selection acting on the genome would not significantly affect the protein. Even these so-called neutral mutations, however, can affect the efficiency with which such proteins are manufactured.

In almost every organism studied so far, a distinct preference or bias exists for a particular codon for each amino acid. For example, among all the 6 different codon triplets that code for leucine in *E. coli* 49% are CTG, while in yeast 10% of leucines use this code compared to 44% in the fruit fly and 41% in humans (Eyre-Walker, 2002). In *E. coli*, for lysine the AAA code is used 75% of the time and the AAG code is used only 25%. In contrast, *Rhodobacter* employs the opposite proportion: AAA is used 25% of the time for lysine and AAG 75%. This does not conform to neoDarwinian predictions. If the proportion were the same for all bacteria (which it is not), this could be seen as evidence for evolution. We do not see evidence of a neoDarwinian relationship in this pattern—organisms that are judged closer by evolution criteria do *not* have a similar coding usage bias.

If a cell rarely uses a specific codon, it produces lower levels of the tRNA needed for that codon (Clark and Russell, 1999). As a result, mutation from AAA to AAG will still produce lysine, but the tRNA needed for AAG will be in such short supply that protein synthesis will not proceed as rapidly as normal. NeoDarwinists argue that the code evolved first, and then the tRNA regulation level evolved later. But it could just as well be argued that tRNA regulation developed first, and this influenced the protein code selection so that more of certain tRNAs caused the code used by that tRNA to become more common. Nonetheless, no evidence exists that a change occurred either way in either the code frequency or in the tRNA regulation.

Mutational Changes Are Not Random

Another of the many objections to the mutation/selection theory (and the weasel analogy as well) is that it assumes all possible single-base pair substitution mutational changes of each base pair have an equal probability of occurring. It will be shown that this is not the case—certain changes are far more likely to occur than others. In addition, when random mutations take place, certain amino acids are also far more likely to be produced than others (Lewin, 1997).

If the GGT DNA codon mutates to TGT, the mRNA produced by the DNA template during transcription would be UGU instead of GGU and, as a result, cysteine would be incorporated into the resultant protein instead of glycine. The DNA coding strand or non-template strand mutations affect the germline, and the complement strand, also called the template strand, is used to produce the mRNA that is identical to the coding strand, except in mRNA where a uracil is used instead of a thymine. Given the average gene, and assuming that equal numbers of mutations occur at each base pair, the probabilities shown in Table I will be produced, demonstrating, as will be explained below, degeneration of genomic information.

As shown in Table I, almost 60% (59.7%) of the amino acids produced by a random selection of three base pairs will consist of just eight amino acids (serine, arginine, leucine, threonine, alanine, glycine, valine, and proline). The twelve other amino acids will be produced only about 35% of the time. Two amino acids (tryptophan and methionine) are coded by only *one* m-RNA codon, 1.6% each. Serine and arginine can be produced by six different combinations of base pairs, whereas typtophan and methionine can be produced by only one codon. Because *certain* amino acids would be far more likely to result from mutations that cause a DNA base pair change, deterioration would result in the increasing dominance of certain amino acids and the increasing rarity of other amino acids. The result would be a loss of information. Random mutations will ultimately lead to a gradual increase of the eight amino acids and a decrease of the others, especially methionine and tryptophan. As mutations accumulate, the result will be an increasingly larger number of certain amino acids in the genome, especially in areas of the genome that are not subject to natural selection.

As a result, when random bases are produced (assuming that all bases have an equal probability of being produced), serine, arginine, leucine, valine, proline, threonine, alanine, and glycine will, in time, come to dominate the genome. This disparity would have worked against producing the code by natural selection in the first place.

This does not happen in the natural world today, however, because natural selection functions as a conserving force to select out deleterious genetic changes. Likewise, changes that are beneficial will be selected for, but these helpful changes are close to nonexistent, indicating that the genome was optimal from the beginning. Natural selection operating on mutations may in some cases optimize survival if acting on an existing functional gene, but mutations cannot build-up the code in the first place.

A preliminary analysis of the DNA finds that the proportion of amino acids existing in genes, introns, and other DNA are not what would be expected by natural selection. When DNA that has no known function, (excluding DNA used for regulatory purposes, for centromeres, for telomeres, and for the production of RNA or tRNA) is examined, the patterns found are clearly in contrast to expected random mutational patterns shown in Table I. This shows that random changes have had only a small role in producing the genome, both in its protein coding and noncoding sections. Part of the reason is that mechanisms that function to resist change in the DNA genome exist. But these repair mechanisms would not have existed in primitive cells, which would mean that rapid genomic degeneration would have occurred before the repair system had evolved. These facts also argue against the conclusion of Ayala (1978) that the ultimate source of genome information of all life was mutations.

The likelihood of producing certain *families* of amino acids such as polar and non-polar, must also be determined. This classification of randomly produced amino acids is important in protecting genome information because members of the same amino acid family have similar functions in producing the required protein conformation. Amino acids from one family can sometimes be interchanged and still produce a functional polypeptide or protein. The

Table I DNA Mutation Probabilities

Serine	**N***	**Percent****	**Threonine**	**N***	**Percent****	**Cysteine**	**N***	**Percent****
TCT	6	9.4	ACT	4	6.3	TGT	2	3.1
TCC			ACC			TGC		
TCA			ACA					
TCG			ACG			**Glutamine**		
AGT						CAA	2	3.1
AGC			**Alanine**			CAG		
			GCT	4	6.3			
Arginine			**GCC**			**Asparagine**		
CGT	6	9.4	GCA			AAT	2	3.1
CGC			GCG			AAC		
CGA								
CGG			**Glycine**			**Lysine**		
AGA			GGT	4	6.3	AAA	2	3.1
AGG			GGC			AAG		
			GGA					
Leucine			GGG			**Aspartic Acid**		
TTA	6	9.4				GAT	2	3.1
TTG			**Isoleucine**			GAC		
CTT			ATT	3	4.7			
CTC			ATC			**Glutamic Acid**		
CTA			ATA			GAA	2	3.1
CTG						GAG		
			Stop					
Valine			TAA	3	4.7	**Phenylalanine**		
GTT	4	6.3	TAG			TTT	2	3.1
GTC			TGA			TTC		
GTA								
GTG			**Tyrosine**			**Typtophan**		
			TAT	2	3.1	TGG	1	1.6
Proline			TAC					
CCT	4	6.3				**Methionine**		
CCC			**Histidine**			ATG	1	1.6
CCA			CAT	2	3.1			
CCG			CAC					

* is the number of ways the particular amino acid can be produced.

** Percentage figures are the percentage of codons the value of N represents out of the 64 codons possible in the DNA "dictionary."

random production of amino acids based on frequencies of m-RNA codons would yield too few (only 18.8%) of the charged amino acids that are critical to produce the hydrophobic interaction required to maintain the correct conformational structure of proteins (Ritter, 1996, p. 69). Only 4.7% of the 64 randomly produced codons would lead to the sulfur-containing types of amino acids (methionine and cysteine) necessary for disulfide bonding in proteins. Random production of the codes for amino acids would also tend to produce a high percentage of nonpolar uncharged and polar uncharged amino acids (62.7%).

Some mutations would help to restore the structure but the trend would consistently be toward nonpolar uncharged and polar uncharged amino acids which would cause a deterioration of the genome. For every mutation that would help to restore the structure, more would occur that would move the genome toward the most likely amino acid type. The next research step is to determine how common each of these amino acids is in the proteins of various organisms. A preliminary review indicates that there exists a great contrast between expectations due to random changes and what actually exists, assuming natural selection produced the genome.

Biased Conversion of a Nucleotide Base into another Base

Mutations can change one nucleotide base into another. The extant genetic research indicates that nucleotide conversion by mutations is not random, but highly skewed. One of the most common conversions is of a cytosine into a uracil (Ridley, 2001). The major reason why this specific conversion is so frequent is that cytosine needs to lose only a methyl (CH3) group to become a uracil. This change can also be caused by nitrites that replace the amino group in cytosine with a hydroxyl group, converting cytosine into uracil that introduces an Adenine on the compliment strand of DNA (Pool et al., 2001; Clark and Russell, 1999).

This mutation of C into U does not normally produce permanent changes in animals today because a specific, dedicated, repair enzyme system exists to monitor and repair this common incorrect conversion (Reader and Joyce, 2002). As a result, C-to-U mutations are uncommon in organisms that have this repair system. The chemical instability of cytosine, which readily deaminates to uracil, is so great that origin-of-life theorists hypothesize that the early life forms must have used a different set of bases, such as diaminopurine instead of cytosine, in order to survive (Reader and Joyce, 2002). Aside from lack of evidence, this solution creates a whole new set of problems, not the least of which is the need to postulate that the code existing in all life today was in the past a different code because no life form currently uses diaminopurine or other bases.

Degeneration of the genome also occurs as a result of mutations in living organism because certain bases are far more likely than others to result from mutations, such as the conversion from Guanine (G) to Thymine (T) that will eventually produce TTT (UUU in mRNA), the code for phenylalanine.

An example of this method of degradation is illustrated by the words “amino acid” which would be changed to “amano acad,” then to “amaao aaad,” and finally to “aaaaa aaaa” if the letter “a” dominated. Another mutation can change the “a” back to an “m” or another letter but, in this illustration, the overall trend would be to the letter “a” and would eventually stabilize largely at a set of “a” letters with a few converting back to other letters from time to time.

Before the repair system could have evolved, there would have been no way effectively and efficiently to counter this common type of degeneration. Damage from degeneration would have been rapid and potentially lethal. The C-to-U change would likely have been a very common mutation type in the putative early stages of evolution, causing what we could call mutational “meltdown.”

Another problem is mutational rate differences in single-stranded compared to double-stranded DNA. For example, cytosine is converted into uracil in single stranded DNA about 200 times more often than in double-stranded DNA. This would also have contributed to a mutational meltdown very early in evolution because pre-biotic evolution of simple to complex requires that the first RNA and DNA molecules would have consisted of simpler, single-stranded units.

Another problem with such theoretical single-stranded precursors of life, apart from deamination of cytosine, is that all DNA bases become detached from single-stranded DNA about four times more often than they do from double-stranded DNA (Ridley, 2001, p. 91). This would have inevitably lead to frequent backbone cleavages and the resultant breakdown of the nucleic acid strands.

Bias in Mutational Types

Studies of bacterial mutations has found that a pervasive bias toward deletions rather than insertions exists (Andersson and Andersson, 1999; Gregory, 2004). Zhang and Gerstein (2003) found deletions were about three times more common than insertions. Another study found a “virtual absence of insertions and a remarkably high incidence of large deletions” (Petrov and Hartl, 1997, p. 279). This deletional bias produces a strong tendency to lose base pairs, which results in a clear genome deterioration that must be selected against by natural selection and other mechanisms for a life form to survive. This, again, illustrates a conserving role for natural selection. The same bias favoring loss above insertion has been found true for other types of mutations, including point mutations, nonsense mutations, and other mutation types.

Research Has Also Demonstrated Bias in Mutation Direction

Some non-random mutational base changes are more likely to occur than others. Genetic recombination studies have found, for example, that heterozygous organisms "produce an excess of one allele in their gametes" resulting in biased gene conversion and resultant genome deterioration (Eyre-Walker, 2002, p. 177). Studies of bias revealed that nucleotide mutation tended to go one way more frequently than the other (Freeman and Herron, 2001). Eyre-Walker (2002) also found that "there are many more GC —> AT than AT —> GC mutations, particularly in genes with high GC3" content (p. 178). If this bias occurs even to a small extent, mutations would produce more and more thymines until eventually thymies would dominate the genome. Furthermore, entropy would increase more rapidly if the four DNA bases were used rather than Dawkins' 26 letters. The reason is that far more changes are required to reach homogeneity with 26 letters than with four.

Mutation Hot Spots

Studies of mutations have shown that mutations are much more common in some areas of the genome termed "hot spots" than in others known as "cold spots" (Jorde et al., 1997; Stadler, 1942; Zhang, et al., in manuscript; Mira et al., 2001). In these mutation studies, workers have found that a large percentage of known mutations occur in only a number of possible loci. Freeman and Herron (2001) noted that only two mutations accounted for 94.4% of the 319 mutations identified in one gene.

A worker in another study of mutations in a human germline of the tumor suppressor anti-oncogene gene p53 found that, of the approximately 400 codons whose mutations were mapped, only 35 mutations were at sites other than in four codons, numbered 175, 245, 248, and 243 (Vogelstein and Kinzler, 1998). Similar observations have been made for other types of cancer genes and many non-cancer genes. Origin by natural selection cannot account for the existence of hot spots. These hot spot patterns are found in both germline (inherited) and somatic mutations (Vogelstein and Kinzler, 1998).

One of the most common mutational hot spots is the CG dinucleotide, which is involved in mutations about 12 times more often than other dinucleotide sequences (Jorde et al., 1997). Another hot spot cluster involves the *ras* gene/mutations which are at codons 12, 13, and 61 (Clark and Russell, 1999). Bonaventure et al. (1996, p. 148), found that "more than 98%" of all cases of achondroplasia are a result of mutations in the transmembrane receptor domain that often involves a missence substitution in the first tyrosine kinase domain of the receptor. Another example is that about 70 percent of all cystic fibrosis patients have the same defect—a small deletion of 3 bases that code for phenylalanine—which is another hot spot (Clark and Russell, 1999).

Although some of these examples that appear to be mutational hot spots actually result from the fact that many mutations are inherited, most are true hot spots. Approximately one-third of all cystic fibrosis cases result from a novel mutation in one location on the gene, indicating that the area is a true hot spot, and is not the result of the parent's carrying cystic fibrosis alleles. Evidently all genes contain hot spots, although new sequences and further study of individual variations may reveal some exceptions.

One major hot spot area occurs where DNA sequences contain repetitive or short, repeated, similar sequences. Small insertion mutations are relatively common events, often occurring due to "slippage" or "stuttering" of DNA polymerase enzymes during DNA replication. These cause various mutations such as "triplet-repeat, expansion disorders." As is true when editors scan a manuscript, spelling errors in words with multiple letters such as "addresses," or "assesses," often are missed, and misspellings such as "accessses" or "assessors" are allowed to slip by (Lewis, 2003). Another possible cause for the increased incidence of repeat DNA sequence mutations is that symmetrical or inverted repeat sequences allow abnormal base pairing to occur *within* a strand when local DNA strands unwind to prepare for replication. This condition can interfere with both replication and repair enzyme functions, thereby increasing the likelihood of errors.

An example is the clotting factor IX gene, which, when damaged, causes the hemophilia B blood clotting disorder. Mutations in this gene occur up to 100 times more often at 11 specific sites within the gene that have relatively long CG dinucleotide repeats. Similarly, an inherited form of the bone-weakening condition, osteoporosis, is usually caused by an extra thymine that is inserted into a specific three base homopolymer of thymine in the normal gene (Lewis, 2003). The result is a tendency to produce nucleotide "stuttering" at this hot spot. In Dawkins' (1986) example, this would be illustrated by the degeneration of changing weasel into weasssel.

The mutational probability varies by as much as 50% from one gene to another gene. A study by Stadler found that in corn the number of mutations ranges from zero to 492 per million gametes, depending on the gene (Freeman and Herron, 2001).

Another factor that influences the frequency of gene mutations is the size of the gene. All other things being equal, the longer the gene, the greater the statistical expectation of a mutation. The genes in which mutations cause both cystic fibrosis and phenylketonuria are abnormally large. These two diseases are among the more common genetic defects found today (Clark and Russell, 1999). Factors such as the specific location of the gene in the chromosome, its structure, and its proximity to histones likewise affect the frequency of mutations. These empirical findings are also of a major concern for medicine. They explains why over 1,085 diseases are caused by mutational errors (McKusick, 2002).

A clear trend exists for mutations to degrade the genome, resulting in a loss of information. This is because the strong tendency of mutations is to shift the genome content in the direction of *less* useful information (e.g., a higher proportion of pyrimidines, specifically thymine). This change creates a serious problem for the mutation/selection model, and helps to explain why the vast majority of mutations have a detrimental effect on the functionality of the final protein coded by the DNA.

These are a few of the many reasons why mutations tend to produce non-random patterns. Non-randomness results in *deterioration* of the genome because when a greater likelihood exists that certain combinations of nucleotides will be produced than others, certain base combinations become increasingly frequent. This process produces more and more nonfunctional proteins. These are all reasons why most of the expressed mutations are lethal or detrimental.

Systems and Mechanisms Designed to Reduce Degradation

One reason why mutations are kept at bay is that the coding regions of the genome are repaired much more effectively than most noncoding regions, and several repair systems are active *only* on transcriptional genes (Freeman and Herron, 2001). Freeman and Herron (2001) write that the "most transcriptionally active genes are repaired most effectively," and that the "accuracy appears to be the greatest where mutations could be the most damaging" (p. 85). It could be logically asserted that this accuracy is a tribute to design, not evolution. Many deleterious mutations are eliminated by natural selection and this too helps to protect the genome from deterioration.

Dawkins and others have argued that the tendency of the genome to degrade is not fatal to neoDarwinian theory. Their main defense is that selection pressure works against these strong deteriorative tendencies. NonDarwinists have long recognized this protection by natural selection, as summarized in Bergman (2001). The tendency of the genome to degrade, however, militates against its ever *producing* a functional gene upon which selection could occur. A living organism that can survive in a specific environment must first *exist* for selection to occur. Dawkins' mechanism cannot function until a living, functioning organism first is present. Even if DNA could somehow replicate outside of a living cell, it would rapidly degenerate for the reasons discussed above. DNA is a very unstable chemical molecule. Without complex systems to constantly repair and maintain the genome, it deteriorates readily by oxidation and other normal chemical processes

Evidence for Beneficial Mutations

It is also widely known that beneficial mutations are extremely rare. Some workers have estimated that far less than .01 percent of all expressed mutations are helpful to the organism. As Francisco Ayala (1978) noted "mutation is the ultimate source of all genetic variation," but useful genetic variation "is a relatively rare event...." (p.63). Dobzhansky (1957) likewise concluded that "the mutants which arise are, with rare exceptions, deleterious to their carriers, at least in the environments which the species normally encounters" (p. 385). The conclusion that very few beneficial mutations occur in nature is still held by many today. Strickberger (2000) admits that "new mutations that have an immediate beneficial effect on the organism seem generally to be quite rare" (p. 227).

In order to locate all alleged examples of beneficial mutations, I carried out a computer search of the literature. My review covered all published scientific studies that dealt with beneficial mutations. The definition of beneficial mutation used was a mutation that was regarded as beneficial by the authors surveyed. Key words used in the computer search included synonyms of beneficial, such as "favorable, helpful, usable, valuable, adaptive, good, advantageous, supportive, positive," etc. The search of two databases totaling 18.8 million records found that, of all articles discussing mutations, only 0.04 percent, or 4 in 10,000 articles on mutations, were located that discussed beneficial or favorable mutations. Some overlap exists in the data bases searched, consequently the actual total number of records searched was less than 18.8 million. The overlap in the search was estimated by extrapolating from the records found. Assuming that the same level of overlap exists in the entire

Table II. Results of Literature Search

	Database Searched		
Search Limiter	**Biological Abstracts**	**Medline**	**Total***
Total Mutation(s)	170,527	283,205	453,732
Beneficial Mutation(s)	98	88	186
Percent Beneficial	0.06	0.03	0.04
Total Records Searched	6,434,067	12,373,719	18,807,786

* The search method used produces some overlap between databases that must be eliminated by manual inspection. The literature data base covered from 1966 to October 27, 2003.

database, a total of approximately 16 million records was searched. These searches may have missed some relevant articles but are useful to indicate trends.

All of the 186 examples located were then reviewed, focusing on evidence for information-gaining beneficial mutations. It was found that none of them contained clear, empirically supported examples of information-gaining, beneficial mutations. Most "examples" of actual, beneficial mutations were loss mutations in which a gene was disabled or damaged, all of which were beneficial only in a limited situation.

A review of both textbooks and journal articles on evolution demonstrated that the most common examples of beneficial mutations were sickle cell anemia, bacterial resistance to antibiotics, Ancon short legged sheep, viral/bacterial immunity, and a "putative beneficial mutation for lipid transport" (Galton et. al., 1996; Strickburger, 2000).

An example of a mutation that was beneficial in specific situations was damage to the Chemokine receptor 5, (CCR5), the principle co-receptor in T-cells that causes cells with CD4 receptors (primarily T-cells) to be unable to take the human immunodeficiency virus (HIV) into the cell. As a result, a person with this mutation has an abnormally high immunity to HIV infection (Huang et al., 1996; Wilkinson et al., 1998).

Discussion of the Beneficial Mutation Literature Review

Most of the literature covered the topic of beneficial mutations in general, and did not document specific mutations. The second largest category was literature dealing with loss mutations that were beneficial to humans *only in certain situations*. An example of such loss mutations, illustrating that many "beneficial mutations" were not beneficial for the animal, was a muscle mutation in the Belgian Blue breed of cattle. This is very valuable to beef farmers because it results in 20 to 30% more muscle than average. The meat is also very tender and lower in fat (Seitz et al., 1999; McPherron et al., 1997). A different mutation in the same gene is also responsible for the very muscular Piedmontese breed of cattle.

Muscle growth is regulated by a number of proteins, including myostatin. The Belgian Blue strain mutation deactivates the myostatin gene. Consequently, there is less regulation of the muscle growth, and the muscle bulk becomes abnormally large. Genetic engineers have bred muscular mice by using the same principle. Like seedless fruit and many similar mutations, this one is beneficial to humans only and not to the cattle. Among the mutation's several negative side effects is a reduction of the animal's fertility. Although this Belgian Blue mutation produces "beneficial" effects for farmers and consumers, it is the result of information loss—as are mutations that produce seedless fruit. Therefore, it is the opposite of the production of *new* beneficial information that would be necessary to achieve macroevolutionary changes.

Another example of a so-called "beneficial" mutation that was discovered in 1889 in Atchison, Kansas, is a mutant hornless Hereford cow. Hornless cattle suffer fewer injuries in herds, and for this reason many cattleman had been surgically dehorning their herd. The new breed eliminated this requirement, and it soon became a common domesticated breed (Walker, 1915, p. 68). In the wild, though, the Hereford cow would be at a distinct disadvantage.

The most well known loss mutation was discovered in 1791 by Seth Wright, a Massachusetts farmer. He noted that a male lamb in his flock had short, bent legs resembling a dachshund (Walker, 1915). He realized that a flock of bowlegged sheep could not jump high fences, which could save the sheepherder time and money because only short barriers would be needed to contain them. He carefully raised this sheep, and, as the trait was evidently caused by a dominant gene, he was able to produce a new sheep "breed," which is now called *Ancon sheep* (Hickman et al., 2001). It is now realized, however, that this so-called breed is actually a usually lethal deformity that causes achondroplasia, and this "breed" has rapidly gone extinct in spite of efforts to save it.

The Number of Mutations Neo–Darwinism Requires to Evolve a Species

A total of 1.7 million species of animals have been identified from comparative studies of preserved specimens (Blackmore, 2002). Researchers estimate that somewhere between 3 million and 30 million species now exist. The most common estimate is around 13 million (Margulis and Schwartz, 1998; Blackmore, 2002).

According to an Amersham Bioscience Report (2001), it is estimated that there are thousands of different proteins used in the human body (see also "Preteome" AAAS Science Netlinks). Nuclear pore complexes alone comprise 50 to 100 different proteins (Allen et al., 2000, p. 1651). All of them are produced by the estimated 35 to 45 thousand human genes that, according to neoDarwinists, evolved from other, less-complex, and often shorter genes. Shermer (2000, p. 229) estimates that "trillions of distinct modifications" were required to evolve humans alone. Presumably, each modification would require many mutations.

A significant fraction of open reading frames has been judged not to match any another sequence in the database, indicating that a significant number of all proteins may be unique to each genus of animal (Siew and Fischer, 2003). Thus, as many as 200 million different proteins may exist. From 150,000 to 250,000 extinct animal species have also been identified and reported in the paleontological literature. NeoDarwinists estimate that as many as 99 percent of all species that have ever lived are extinct (Margulis and Sagan, 2002; Raup, 1977). Although some claim the number is far lower, assuming this estimate to be valid would put the number of species that have ever lived at over 200 trillion!

Given the estimate that roughly an average of 1,000 transitional forms are required to evolve a species (a number that is a rough estimate and is dependant on various assumptions)—this would mean that $2x10^{17}$ transitional forms have existed. If 1,000 mutations are required for each transitional form, this would translate into $2x10^{20}$ beneficial mutations that are required. And not one clear beneficial mutation or transitional form has yet been convincingly demonstrated, although likely some do exist. The paucity of clearly helpful mutations must be considered in context with the estimate that $2x10^{20}$ mutations that are required to produce the natural living world existing today and the number of animals that are speculated to have once existed.

Given a low estimate of 1,000 steps required to evolve the average protein (if this were possible) over $2x10^{14}$ beneficial mutations would have been needed to evolve just the proteins that are estimated to exist today. So far only 60 species, including the nematode worm, humans, yeast, rice, mustard plant, and bacteria have had their DNA fully sequenced. As more life forms are sequenced, the above estimates may go either up or down. The same evolutionary problem exists in attempting to use mutations to explain the origin of the genes required to make fat, nucleic acid, carbohydrate families, and other compounds that are produced by living organisms and are necessary for life.

Conclusions

It is critically important to focus on questions involving molecular biology because this area is central to the whole question of neoDarwinism's validity. Although other mechanisms have been proposed to contribute to evolution, the production of new information by mutations is at its core. Therefore, the critical analysis of proposals by Dawkins and others is essential to determine the feasibility of macroevolution by means of mutations and natural selection. An examination of Dawkins' weasel argument showed that it utterly failed to support the conclusion that mutations can produce significant, new, gene-coding information. Numerous reasons exist, aside from those discussed here, as to why Dawkins' example is an excellent illustration of why mutations cannot function as the major, or even a minor means, of creating new genes and new species (Read, 1999; Truman, 1999). A study of hot spots and degradation of the genome by mutations shows that macroevolution by means of mutations is, at best, quite unlikely. Many complex mechanisms including natural selection work against degeneration. The fact that the more active the gene, the more accurate the repair process will be, also mitigates against NeoDarwinism.

All of the beneficial mutations located in my search of the literature involving almost 20 million references were loss mutations and mutations such as sickle cell anemia that have a beneficial effect only in very special circumstances. In most situations they have a decidedly negative effect on the organism's health. Not a single clear example of an information-gaining mutation was located. It was concluded that molecular biology research shows that information-gaining mutations have not yet been documented. While such negative findings do not in and of themselves prove creation, they support the conclusion that an Intelligent Designer formed the original genomes of each created kind.

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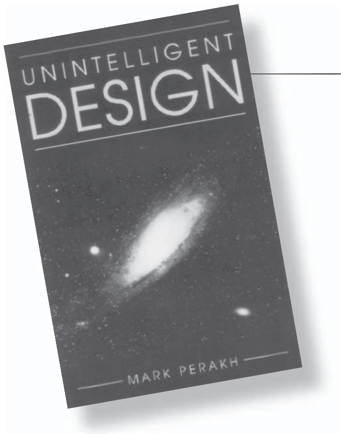

Book Review

Unintelligent Design by Mark Perakh

Prometheus Books, Amherst, New York, 2003, 459 pages, $32.00.

Promethus Books is not known for creation-friendly publications. Still, this massive book is unusually disappointing. Author Mark Perakh is a retired physics professor from California State, Fullerton and he evidently lives in his own world. He defines all young earth creationists as believing every word of the Bible is literal, the universe actually is very small, fossils were created within rocks, science data must be denied (p. 180), and the earth is *younger* than 6,000 years (p. 255). After this barrage of false statements, readers may rightly question every sentence in the book.

Author Perakh attempts to refute the particular writings of William Dembski, Michael Behe, Phillip Johnson, Hugh Ross, Fred Heeren, Nathan Ariezer, and Gerald Schroeder. These writers have often been critiqued in the CRS *Quarterly*. Perakh, however, attacks personalities and quibbles at great length over word meanings. He accuses some creation spokespersons of exploiting the popularity of religious belief to earn a living (p. 428), certainly a tough way to pay the mortgage. Creationists are described as arrogant, inconsistent, irrational, and cowardly in nature. I think fiery Prometheus himself would object to this flawed book.

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The Bible, Epidemiology, and Edenomics

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Abstract

Many evolutionists claim that science has disproved the Bible and they use this claim to discredit creationism. In this paper I view the Bible from an epidemiologic perspective and attempt to show that, contrary to being disproved by science, it can be considered a general guide to medical epidemiology. The concepts of health and disease, the Creation Health Model, and the critical dependence of human health on plant life are discussed and shown to be challenges to Darwinian evolution. Human nutrition and health are immensely complex on the molecular level. I introduce the term *edenomics* to describe the interactions between plant phytochemicals and human cellular biology. Edenomics suggests reductionist understanding of the molecular biology of chronic diseases may remain illusive and that lifestyle may be the most important determinant of health in developed nations. It is concluded that the science of epidemiology supports the Bible and is opposed to neodarwinism.

Introduction

Some claim that science has disproved the Bible and they use this claim to discredit creation. This paper examines the Bible from an epidemiologic perspective. The intent is to scan the Bible for epidemiologic principles and test these against extant, observational science. The paper begins with an overview of biblical epidemiology. This is followed by a discussion of three difficulties for Darwinian evolution: 1) Darwinian medicine, which is criticized as unable to explain health and disease in a compelling manner, 2) The Creation Health Model (CHM), which suggests that health and disease cannot be separated from the Creator and His initial design, and 3) The vital role of plants in human health.

The importance and complexity of plants leads to the concept of edenomics—defined as the intersection of Genesis 1:27, 1:29, and molecular biology. This term signifies the potential intractable nature of plant-human molecular interactions and suggests a limitation in human understanding of the molecular mechanisms of health and disease. Along with the CHM, these two bi-directional positions argue design from scientific findings and, from design considerations, offer health suggestions consistent with modern science.

This paper is not intended to be a magic formula for health because the subjects of health, disease, suffering, and death are quite complex. Wide individual variations in personal susceptibilities and exposures exist, thus precluding a specific "one-size-fits-all" strategy. Nevertheless, some general epidemiologic advice can be found in Scripture. Starting with the Bible and examining it from an epidemiologic perspective, one is led to principles that have widespread applicability in health and disease. Interestingly, starting with an analysis of empiric science leads one back to the Bible's creation story. The Bible's epidemiology is scientifically sound.

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The Bible and Epidemiology

Epidemiology is the study of the distribution of the determinants of health and disease in populations (Gordis, 2000). It seeks to determine both the salutary and deleterious compounds, behaviors, and activities affecting the development of disease. An interesting question is whether or not a model of origins is important in such determinations. While no one would claim that the Bible is a science textbook, some general principles of health, disease, and epidemiology can be found in Scripture, as we shall see.

Animal diets were originally vegetarian, as described in Genesis 1:29-30 (Wieland, 2001; Emerson, 1996; Stambaugh, 1991). The creation record gives the Creator's initial conditions and plans for His creation. This was an ingenious design in which plants and animals could live in a blissful environment essentially existing by the exchange of waste products, such as carbon dioxide and oxygen from animals and plants, respectively. The peaceful, and assumedly painless, environment suggests a benevolent Creator of infinite intelligence. Recognition of the initial design—the disease-free state—is important because it presents a framework on which dietary recommendations can be constructed.

The Fall came next, after which sickness and death entered the world. The actual events that transpired at the time are, of course, unknown. It is reasonable, however, to speculate that a tendency toward the breakdown and decay of physiologic systems leading to disease was introduced. Some microorganisms became pathogenic. It was then necessary to contend with heretofore non-existent diseases, suffering, and death.

Genesis 3:17 and Romans 8:20-23 tell us that the whole creation (including our bodies) was drastically altered at the Fall and made subject to corruption and death. We cannot even guess what our physiology was like in Eden. We can recognize, however, that modern medicine and epidemiology show that a diet rich in balanced plant foods and reduced in meat levels is conducive to good health and longevity even now. This value of plant biochemicals in human nutrition—the connection to the Garden—fits with creation and is at odds with evolution.

Genesis 6:3 states that the maximum lifespan of man shall be 120 years. The maximum length of time one can theoretically live, lifespan, is distinct from life expectancy. Life expectancy is the average length of time one can be expected to live. Life expectancy can change; the maximum lifespan does not. In 2001, life expectancy was 77.2 years in the United States (NCHS, 2004). The Bible gives us a reasonable goal for a viable, maximum lifespan of 120 years. It may be anticipated that implementation of public health measures, disease prevention, modern medical treatments, and agricultural advances, all working together, could ultimately result in people routinely attaining this 120-year goal.

Dietary instructions changed after the Flood

The Flood resulted in a change to the initial vegetarian diet. The post-Flood dietary instructions for the Israelites are delineated in Leviticus. The detailed directions are given as to which animals are allowable and which ones are not. Chewing the cud was important in the determination of edible animals. It suggests that if one cannot be a vegetarian, at least the meat used for food should derive from vegetarian animals. The narrow type of meat eating allowed was one step removed from the originally designed vegetarian diet. These Levitical dietary instructions were apparently based on the initial design and were as close as possible to vegetarianism while permitting some consumption of meat.

Leviticus 3:17 gives advice regarding the consumption of animal fat. It is clear from the context that the "lasting ordinance for generations to come" refers to animal fat and not vegetable fat. Animal fat has been implicated in human diseases such as many forms of cancer (Cohen, 2002) and heart disease. Humans need only the essential fats for optimum health and these can be obtained from vegetable sources (ADA, 2003).

Nowhere in the Bible are contemporary people commanded or even strongly encouraged to become vegetarian or to minimize their consumption of meat. There are numerous Bible passages demonstrating that meat-eating occurred and was not condemned in early church history. One purpose of this paper is to show that human health is enhanced when people consume large and balanced amounts of plant material in their diets and minimize meat eating. It is interesting that while an Edenic diet is not commanded, it is seen to promote health and longevity.

The importance of spices and herbs is also illustrated in the Bible. Recommendations to eat meat with bitter herbs are given in the books of Exodus and Numbers, although the specific spices are not named (Exodus 12:18; Numbers 9:11). Several medicinal benefits of herbs and spices are known (Balch and Balch, 1997). Some are purported to have anti-inflammatory effects. Red meat can have proinflammatory effects leading to inflammatory arthritis (Pattison et al., 2004). Inflammation can play an important role in heart disease and in pathogenesis generally (Li et al., 2005). Consumption of meat with certain spices may have attenuating effects on inflammatory processes. The presence of small quantities of meat likewise adds flavor to vegetable dishes. These biblical dietary regulations were not presented as keys to healthful living. It is fascinating to see, however, that modern research substantiates that they do promote good health.

The book of Daniel contains what may be the first epidemiologic study of vegetarianism (Daniel 1:1-14). Daniel and his colleagues preferred and requested a diet of vegetables and water as opposed to the king's royal food. After two weeks, they looked better than the king's men and they suffered no apparent ill effects. At least in the short term, vegetarianism was just as good as, and probably better, than the royal menu. For Daniel and his friends, a diet consistent with the initial creation and the initial dietary instructions served them well. We must suggest, however, that Daniel's vegetarian stand was taken in order to avoid meats prohibited by the Mosaic Law, and we are not told that these men remained vegetarian later in life (Daniel 10:3).

Isaiah tells us that the wolf and the lamb will feed together and the lion will eat straw (Isaiah 65:25). From vegetarianism the created world came, and apparently to vegetarianism it will return. We cannot suggest that the passages show our Creator would have all people become vegetarian right now. Scientific research does show, however, that it is prudent to eat more vegetables and less meat in this long time period after Eden and before Isaiah 65. It might be interesting to study the effects of increasing the amount of plant food in a lion's diet.

Cleanliness

The Bible is clear regarding the importance of cleanliness, washings, and avoidance of unclean things. The biblical advice predated microbiology by thousands of years. The book of Leviticus is filled with hygienic recommendations which focused on cleanliness, avoidance of contaminated carcasses, and personal hygiene. Wise (1994) has provided a succinct summary. These recommendations were ahead of their time.

Biblical morality is the epitome of primary disease prevention by the avoidance of causative agents of certain diseases. Tobacco-related, alcohol-related, and drug-related diseases are avoidable by not partaking in such activities. Responsible alcohol consumption in very minimal amounts, however, may not lead to diseases, illness, or accidents. Sexually transmitted diseases are also directly avoidable. Primary prevention of disease is the most cost effective strategy for disease avoidance and health maintenance from financial, emotional, and temporal standpoints.

From a public health perspective, good stewardship leads to policies that promote clean air, clean water, sanitation, and other public health measures, which are all part of a healthy environment. The benefits of a clean environment are obvious. Some biblical principles of epidemiology are summarized in Table 1.

Difficulties for Darwinian Evolution

Three difficulties for Darwinian evolution will be discussed: 1) The causes of illnesses, 2) The Creation Health Model, and 3) The human dependence on a plant-based diet for maximizing health and minimizing illness.

Darwinian medicine and the causes of illnesses

Health and disease are hard to define explicitly (Kovács, 1998). For this discussion, health will be defined as a state characterized by anatomical, physiological, and psychological integrity. It is the ability to perform personally valued family, work, and community roles. It is the ability to deal with physical, biological, psychological, and social stress, a feeling of well-being and a freedom from the risk of disease and untimely death (Last, 1988). This straightforward definition is relatively self-evident and avoids lengthy philosophical debate (Kovács, 1998).

Evolutionists face the problem that humans are very susceptible to a wide variety of maladies after having undergone billions of years of evolution. Reasoning suggests that the process of mutation and natural selection over the eons of time in which evolution acted would have led to robust, highly resilient beings without the many susceptibilities humans face. That obviously did not occur. With survival and reproduction as the driving force, evolution would have been expected to "create" humans less vulnerable to disease and more prolific reproductively. Herbert (1998) addresses the above question regarding human disease susceptibility,

> The idea that evolution is progressive, leading to an ever more perfect organism immune to disease, is a residue of 18th and 19th century Enlightenment thought. It quite fails to take into account that many evolutionary lineages and more than 99.9% of all species that once lived are extinct or that brains and bodies of *Homo sapiens* have become smaller in the last 50,000 years: hardly criteria for progress. Nature is blind, random, and capricious; it has no purpose in mind except to select organisms to survive in order to reproduce. It does not strive for perfection, complexity, diversity, or greater size. In fact, size may be an impediment—some seeds may get smaller in order to reduce dispersal. All life forms are continually changing. Evolution consists of a change in variation, which may be slight or extreme. Each generation brings new nucleotide sequences (some which are "neutral"), information, and functions, which are continuously tried out in various combinations in an ever-changing environment. In each generation, natural selection refines adaptations. In fact, perfection immune to disease is impossible because, for example, viruses and bacteria co-evolve with and are even assisted in doing so by human beings…. Nature is pragmatic: what works, works, as long as the organism

Table 1: Some biblical epidemiologic principles

Bible verse	Interpretation	Epidemiologic principle	Comment
Genesis 1:29–30	Initial design called for vegetarian diet	Maximize plant-based foods as dietary components	Consistent with evidence
Genesis 3	Fall	Disease, decay, and death entered the world	Consistent with evidence
Genesis 6:3	Lifespan limited to 120 years	Established the standard of measurement	Attainable goal with combined strategy
Leviticus 3:17	Consumption of animal fat prohibited	Animal fat is unhealthy and associated with disease	Consistent with epidemiologic data
Leviticus Various verses	Cleanliness	Hygiene important in infectious disease prevention	Consistent with epidemiologic data
Numbers 9:10–12 and Exodus 12:8	Spices to be consumed with meat and unleavened bread	Natural spices and herbs retard growth of bacteria and molds	Data indicate spices (garlic) can have a favorable effect on serum lipids
Daniel 1:1–14	First epidemiologic study of vegetarianism	Vegetarianism is healthy, at least in the short term	Short-term vegetarian lifestyle can be therapeutic
Isaiah 65:25	Creation may return to vegetarianism	Maximize plant-based foods in diet	Consistent with epidemiologic data
New Testament 1 Cor 6:19	Biblical morality as a model of the primary disease prevention	Primary prevention is the most cost-effective strategy from economic, emotional, and temporal viewpoints	Consistent with epidemiologic data, especially economic. Vitally important in a nation with high healthcare expenditures

> reproduces. It makes no difference to Nature whether illness and disease occur after the organism has reproduced as fruitfully as possible... (p. 511).

Can the above statements be true if the evolutionary processes are primarily concerned with reproduction? Can evolution produce entities like humans from very simple natural resources? Do humans really reproduce as fruitfully as possible?

Evolutionary medicine (Nesse and Williams, 1995) is an attempt to explain health and disease within a neodarwinian framework. It suggests that disease results from a mismatch between the environment and the individual. Diarrhea from an intestinal pathogen, for example, is seen as beneficial to the microorganism in its struggle for survival. Pathogenic interactions and human symptomatology are understandable in the context of reproduction and survival of the infecting pathogen. Chronic diseases are explained as inadequate responses on an organism's part to a changing environment. Reproduction and selection pressures that drive the evolutionary process are believed by evolutionists to solve the susceptibility problems over time. Evolutionary medicine oversimplifies disease as being nothing more than an environmental-fitness maladaptation in the struggle for reproduction and survival.

Whether or not evolutionary theory is even applicable to health and disease is debatable. Gammelgaard (2000) notes,

> It is the primary aim of Darwinian medicine to view the causes of disease and health from a new perspective by proposing models of selection as explanations of the many symptoms of disease…the natural goals of evolutionary theory are hardly applicable to the field of medicine due to the potential incompatibility of the states which are deemed desirable from the perspective of medicine and those which are deemed desirable from the perspective of evolutionary theory (pp. 111,115).

Darwinian medicine is a relatively new and emerging field. Whether it will contribute anything substantive to human health is highly questionable. Its theoretical musings are built on the reproduction-survival-selection paradigm that lies at the foundation of evolutionary thinking. Evolutionists believe that structures, functions, and susceptibilities exist because they were selected across evolutionary time. It is assumed that features which do not exist or no longer exist failed in the process of natural selection. But such tautological thinking explains nothing because it explains everything. Any hypothesis that is so plastic and malleable is immediately suspect. It is therefore anticipated that Darwinian medicine—although quite capable of evolutionary story telling—will contribute little or nothing to the field of medicine in the foreseeable future.

The Creation Health Model

A second problem for neodarwinism is that human health and disease cannot be readily separated from design, the Creator, His creation, and the Fall, as seen in the CHM (Schragin, 2004). The CHM suggests that the probability of developing a disease in a fallen world is an incremental probability function of the increasing deviation from the Creator's initial plan for diet and lifestyle. Small deviations may be allowable if the benefits outweigh the risks. Large deviations present increasing probabilities of disease. Since the CHM is predicated on design, it recognizes creation and is purpose-filled (Romans 1:20). It is in direct opposition to the explanation of Darwinian medicine given above, which is blind and purposeless.

The logic of the model is represented by the following mathematical equation: $P(D(i)) = \alpha(i) + \beta(i) * (e_1 - e_2)$. The model is verbalized as the probability (P) of developing a given disease (D(i)) as a result of an intrinsic probability resulting from the Fall $[\alpha(i)]$ and gene-environment interactions $[\beta(i) * (e_1 - e_2)]$. The first term, $[\alpha(i)]$, represents the baseline probability of a disease resulting from the Fall-induced tendency of decay and breakdown. Regardless of exposures, healthful or harmful, this Fall-induced predisposition inevitably creates risk of disease. It is recognized that this term does not describe the mechanism or magnitude of the baseline risk nor does it offer interventions to reduce it. It is introduced into the model, however, to demonstrate the dependence of health not only on the Creation but also on the Fall, the latter of which leads to idiopathic diseases—those of unknown cause.

The second term, $[\beta(i) * (e_1 - e_2)]$, represents gene-environment interactions. In addition to the baseline risk $\alpha(i)$, there are additional factors, both salutary and deleterious that affect health. The manner in which an individual of the genotype $\beta(i)$ handles those exposures is also conveyed in this equation. $\beta(i)$ is the genetic component that modulates the exposures. e_1 stands for the deleterious exposures that increase the probability of disease. e_2 represents salutary exposures that promote health and decrease the risk of developing disease.

The CHM is a framework to understand the relationship of disease and design. It is not a mechanistic explanation of pathogenesis. To some extent, it avoids reductionism, although it could become reductionistic in the better sense of that term if the probabilities and exposures could be correlated to molecular pathways. The CHM is a higher-level model that suggests behaviors because complete reductionist explanations to health and chronic disease may be elusive. Omnipotent pharmacologic interventions might prove difficult to develop and implement because the interrelated, pathogenic pathways involved in chronic diseases are so numerous and incompletely understood. Consequently, the model emphasizes the importance of primary prevention and lifestyle in health and disease by strongly suggesting that the responsibility for health rests with individuals. The underlying design itself determines the preferred approaches to maximizing health. The CHM is a concise statement summing up the probability of disease as the risk resulting from the Fall and gene-environment interactions. If the CHM is correct, then Darwinian evolution has one more problem that it does not adequately explain: *health and disease are inexorably linked to Creation, to human purposeful behavior, and to the Fall.*

The critical importance of plants

The third problem for neodarwinism is the importance of the plant-based, garden-like diet in human health (see

Table 2: Plant food examples and representative phytochemicals

Family	Vegetable	Representative phytochemicals
Brassicaceae	Broccoli Cauliflower Brussel sprouts Cabbage Kale Kohlrabi	Isothiocyanates, selenium Vitamins A, C, K Vitamins A, C α and β carotene, lutein β carotene, zeaxanthin Vitamins A, C, β carotene
Lily	Onions Garlic Leeks Shallots Chives	Vitamin C, folate, lutein Various sulfides Vitamins A, β carotene, lutein Vitamin A Vitamin K, β carotene, lutein
Other	Blueberries Raspberries Apples	Resveratrol, anthocyanidins Anthocyanidins, carotenoids Flavonoids

From USDA, 2004.

Table 2 for a brief list). An extensive number of other vital fruits, vegetables, grains, legumes, nuts & seeds, and herbs & spices could be immediately added to the table. The vital phytochemicals for each type of food could also be expanded based on extant knowledge because the average fruit or vegetable has many more nutrients. Not all the vital chemicals available in the varieties of plant-based foods are presently known (Balentine, 1999). The number of critical phytochemicals in plants will grow larger with further research.

Dietary studies continually report new salutary components in plant foods. Recent examples include walnuts, whole wheat, green tea, and blueberries. Walnuts may improve the lipid profile in type 2 diabetes due to their omega-3 acids and antioxidants (Tapsell et al., 2004). Whole wheat contains a complex phytochemical and antioxidant profile (Adom et al., 2003). Green tea may reduce the risk of hypertension (Yang et al., 2004). It contains other important compounds including the flavonoid EGCG (epigallocatechin-3-gallate) (Beecher, 2003). Blueberries contain resveratrol, an antioxidant which may also function as an anticancer compound (Schultz, 2004). Epidemiology literature is replete with many more examples.

Sometimes it is not always clear what is a medicine and what is a food, and we are reminded of what Hippocrates said, "Let your food be your medicine and your medicine be your food." To a healthy person vitamin C is considered a food, but in the pathologic condition scurvy vitamin C is a medicine. At least 30% of modern medicines are plant derived (Winslow and Kroll, 1998) and many more are modeled after plant components. There are many phytochemicals, such as EGCG and quercetin, that do not have a recommended dietary intake (RDI). But they are nevertheless considered important in human health. It is reasonable to speculate that numerous other medicinal aspects of plants are yet to be discovered. It is an unarguable, inescapable conclusion that optimal human health is critically dependent on plants as foods and medicines. What is merely a phytochemical today may be tomorrow's nutrient with an RDI and someday it may be a pharmaceutical with dispensing and dosing instructions. In His creation, the Creator provided a wide variety of plant foods, suitable for a large variation in individual tastes and preferences with potential medicinal qualities.

Major health organizations now recommend an increase in the amount of dietary plant-based foods. This presents a major difficulty for a Darwinian explanation because the theory of plant evolution is currently problematic. There are unanswered questions, missing fossils, and inadequate support for plant evolution (Comninellis, 2001). Consequently, evolution cannot explain the development of the vast number of varieties of nutritious foods. The Brassicaceae family, for example, includes broccoli, cauliflower, brussel sprouts, cabbage, kale, and kohlrabi. The ultimate origin of this family is unknown. Evolutionists speculate that millions of years ago a common ancestor led to the development of this family. The evolutionary forces are believed to have been the dynamic duo of mutation and natural selection operating under reproductive pressures.

However they originated, Brassicaceae contain phytochemicals that are very important for human health (Liu et al., 2002). Specifically, broccoli contains isothiocyanates (Thornalley, 2002) and many other important nutrients that have an RDI. The story can be repeated for another vegetable family. The lily group includes such plants as onions, garlic, leeks, shallots, and chives. Somewhere in evolutionary time and space, the lily family and members all derived from a common plant ancestor. Whenever it happened and whatever actually happened, the lily family members contain phytochemicals important for human health.

Many fruits contain vital phytochemicals (Sun et al., 2002) and the origins of fruits are not known. Therefore, the vague evolutionary claims are repeated for fruit-bearing plant families, each breaking off from the so-called evolutionary tree at different points in space and time. The same unlikely theme must continue for other fruits, vegetables, grains, legumes, nuts & seeds, and herbs & spices. Each contains phytochemicals important for human health. The fact that humans can alter the composition by breeding does not lessen the problem of how people came to depend on them in the first place and why this dependence existed prior to domestication of plants. Table 2 gives a mere starting point delineating a very small number of plant foods and some of their nutrients.

Prior to domestication and human plant breeding, a very large, theoretical, evolutionary tree with a multitude of branch points must be constructed. Each branch must come with molecules vital in human health but not essential for plant reproduction (Bergman, 1998). In some unexplained manner, evolution had to cause a vast array of plant-foods to develop. The struggle for mere survival is the driving mechanism of evolution, but these plant-foods contain phytochemicals critical to human health and not for plant reproduction (Lumsden, 1993). We are asked to believe that evolution repeatedly "just happened" to develop all these compounds essential for human life. The process had to yield hundreds of branch points in the speculative history of plant evolution—a highly unrealistic scenario.

Thousands of years before the advent of microbiology, the Bible's recommendations concerning hygiene were correct. Its initial dietary instructions should also be considered carefully. The plant-based diet as initially designed may contain complex, and possibly unexplainable, phytochemical interactions and synergisms necessary for disease prevention. But we cannot speak with certainty because we are not absolutely sure that the pre-Fall conditions would be applicable to our post-Fall existence. Phytochemical synergisms have become a major focus of research (McCarty, 2001; Liu, 2003; Jacobs and Steffen, 2003). There may be interactions and/or synergisms between known and yet-to-be discovered phytochemicals that are critical to optimum cell function and to health in general (Finley, 2003; Eastwood, 2001).We may be passing from genomics—the study of genes, to proteomics—the analysis of proteins for their identity, quantity, and function (Peng and Gygi, 2001), to nutrigenomics—the study of nutrients and their effect on cellular/genetic processes (Kaput and Rodriguez, 2004). Combinations of foods may play a greater role in health than individual foods, and consequently, another column could be added to Table 2 describing phytochemical-by-phytochemical interactions, the complexity of which is staggering. All of this will present new problems for neodarwinism. A question for evolutionists was: "Why does one plant-derived compound support human health?" That may change to: "Why do many different foods from diverse plant species have compounds that act *synergistically* on the intricate workings of the cell, the cell-cycle, and DNA to promote human health?" One can fully anticipate that Darwinian evolution will be unable to explain phytochemical synergisms in a satisfactory manner.

The two competing views are that the garden-designed, plant-based diet was made by an omnipotent Creator or that it all arose by evolution. But evolutionary theory is short on specifics and long on speculations. Neodarwinism does not offer compelling explanations for the dietary and medicinal importance of so many plants. Ultimately it comes down to a question of which origin's view is more credible. I think that an objective assessment of the available facts strongly suggests purposeful design.

Edenomics and Design

I devised the term "edenomics", defined as the intersection of Genesis 1:27, 1:29, and molecular biology, to designate the idea that the Creator-designed molecular interactions and synergisms between human health and the phytochemicals found in plants and humans are so complex that a complete reductionist understanding may not be possible. A review of the biochemistry of only one herb, garlic (Bannerjee et al., 2003), gives an example of the complexity. Edenomics is a logical conclusion to the genomics-proteomics-nutrigenomics sequence and signifies the potentially unexplainable combinations and permutations of phytochemical-human molecular interactions. It suggests that comprehensive pharmaceutical solutions may not be forthcoming for complex, multifactorial, chronic diseases. Edenomics may represent a limit on human understanding of human-plant interactions.

The CHM and edenomics are bi-directional positions. Starting with science, they argue for design and starting with design, they offer health suggestions. Based on expanding epidemiologic knowledge, they recognize the Creator's work. This is the single most important aspect of edenomics and the CHM. Their support for the Creator is at their essence. From the design perspective, they offer suggestions for improving health that are not readily apparent from the neodarwinian viewpoint. Other important aspects of edenomics are the anticipation that many more vital nutrients will be identified and they will come from plant life; that the current understanding of plant-human molecular interactions is rudimentary and complete reductionist understanding will remain elusive; that molecular biology, i.e. genomics-proteomics-nutrigenomics, etc. will probably be unable to completely explain the interactions; that chemoprevention and dietary supplementation will be limited in their effectiveness as natural foods have the correct balance of nutrients; and that a diet with a maximum amount of a very wide variety of natural, plant-based foods is preferred for optimizing health regardless of meat consumption. Table 3 delineates the principles of edenomics.

Table 3: Principles of edenomics

Recognition of the Creator's infinite intelligence and initial creation; science points toward design, design suggests health models
Many more vital nutrients will be identified and they will come from plant life
Current understanding of plant-human molecular interactions is rudimentary and complete reductionist understanding will remain elusive
Molecular biology; i.e., genomics-proteomics-nutrigenomics, etc. will probably be unable to completely explain the interactions
Chemoprevention and dietary supplementation will be limited in their effectiveness as natural foods have the correct balance of nutrients
A diet with a maximum amount of a very wide variety of natural, plant-based foods is preferred for optimizing health regardless of meat consumption

Edenomics suggests a change in health strategy from reductionism with resultant molecular targeting of chronic diseases to a higher-level lifestyle approach rooted in primary prevention. This leads directly to the CHM with its higher-level approach to optimal health such as behavioral and dietary choices.

Creation, Health, and Diet

Having established the Bible as a source of epidemiologic information, we now ask what recommendations can be gleaned for our society which has passed through the epidemiologic transition. This transition occurs when a developed country or society passes from acute infectious diseases to chronic diseases as the major source of morbidity and mortality (Omran, 1971). This has occurred in most developed nations such as the United States. The key difference is that infectious etiologies usually involve one individual infectious agent while chronic disease etiologies are multifactorial and chronic diseases are generally much more complex pathologically. Infectious etiologies generally lend themselves to a pathogen-treatment analysis while the pathogenesis of chronic disease is more complex. Consequently, lifestyle becomes very important in disease etiology. In persons without unhealthy habits, diet is probably the most important modifiable factor.

Profound changes occurred at the Fall. The state of the world before and during the Fall, as well as pre-Flood plants, are not known. There is no treatise comparing and contrasting human anatomy and physiology pre-Fall and post-Flood. Consequently, the unidentified transitions at the time of the Fall and Flood lead to theoretical considerations regarding health and disease.

Theories of health, disease, and human diet are still being developed. A large amount of uncertainty exists. There are many claims purporting dietary solutions to health problems or the most favorable diet. Science is just beginning to appreciate the complexity of nutrient-gene-environment interactions ingeniously designed by the Creator. Extant knowledge of nutrient-gene-environment interactions is too rudimentary to know the optimal diet. Consequently, any discussion of the best possible diet for health at this point in time is somewhat speculative. What is not theoretical, however, is the retained dependence upon plant life for human health. There exists to this day, despite the Fall, a strong connection to the garden-like diet. (It is understood that plants have experienced changes resulting from the Fall and Flood. Extant plant life, however, is what we have to work with.)

Vegetarian diets can achieve complete nutrition (ADA, 2003; McDougall, 2002). However, a wide variety of plant-based foods is necessary. Not all vegetarian diets are nutritionally equivalent. The prefixes ovo, lacto, and pesco are used to differentiate the types of vegetarianism with respect to the consumption of eggs, milk, and fish, respectively. The variety of plant-based foods, however, is not generally specified. I use prefixes that describe distributional dispersions from mathematical statistics to introduce the terms platyvegoid (a wide variety of plant-based foods), mesovegoid (a lesser variety of plant-based foods), and leptovegoid (a small variety of plant-based foods).

Carnivorism can be classified as minimal, moderate, or maximal meat consumption. The vegoid nomenclature discussed above can be extended to carnivores. The terms platyvegoid carnivores, mesovegoid carnivores, and leptovegoid carnivores can be used to describe the breadth and depth of plant-based foods in a meat eater's diet.

Table 4 delineates a cross table of 21 possible diets. This is condensed for discussion purposes by not allowing combinations such as lacto-ovo, etc. The bottom row is considered least healthy, regardless of column, because the breadth of plants in the diet of leptovegoids is too narrow. The top row is considered the healthiest due to the wide breadth of plants in the platyvegoid diet. The proper column is not known with certainty. The middle row is intermediate except the maximum carnivorism cell. It is possible for a

Table 4: Dietary types

	Vegan	Lacto	Ovo	Pesco	Minimal carnivore	Moderate carnivore	Maximal carnivore
Playty-vegoid	H*	H	H	H	H	I	L
Meso-vegoid	I	I	I	I	I	I	L
Lepto-vegoid	L	L	L	L	L	L	L

L-least healthy; H-healthy, *-requires diligence; I-intermediate. Table is simplified by not allowing combination categories; e.g., lacto-ovo-mesovegoid.

platyvegoid carnivore to be healthier than a lepto or meso vegetarian. The reason is sometimes attributed to the meat, eggs or fish (Key et al., 1999), when in actuality it may be that the consumption of a wide variety of plant foods is the overriding factor. The CHM and edenomics suggest the top row and no more than minimal meat consumption. A wide variety of plant-based foods is important (Tucker, 2001).

The Bible does not mandate vegetarianism nor does it recommend amounts of meats or vegetables. To the first approximation, caloric intake is a zero-sum game since there are only so many calories a person can consume. In zero-sum caloric intake, moderate or heavy meat consumption occurs at the expense of the more salutary, Creator-designed and initially-intended plant foods for which we have a retained a post-Fall dependency. The preferred dietary cell in Table 4 has not been determined; it may not be possible to make such a determination. The biblical account and the garden-like diet as initially designed by the Creator may be a reasonable point of reference. If so, then the CHM may be expected to yield a slight J-point mortality curve with no more than minimal meat intake and maximal plant consumption leading to the trough. The platyvegoid minimal carnivorism cell or something very close to it may represent the closest approximation to the preferred diet.

The Creator has provided, through the garden design, elements for health in plants. Results from epidemiologic studies strongly suggest that, regardless of the events surrounding the Fall and the Flood and the current state of the world, the initially designed dietary plan *cannot be disregarded* even in the fallen world full of disease. The studies suggest a *wide* variety of natural, unprocessed, plant-based foods; i.e., platyvegoid plant consumption regardless of meat intake, to reduce the incidence and prevalence of chronic diseases. The complexity of an individual's genetic makeup, including Fall-induced mutations, and the large diversity among people, makes it nearly impossible to develop a single approach to dietary disease prevention. The edenomic strategy involving primary prevention with the CHM and without dependence on pharmaceuticals, however, may provide the basis for individual health programs involving therapeutic plant phytochemicals. Edenomics and the CHM are predicated on design rather than on neodarwinism—glorifying the Creator (Romans 1:20) rather than the creature.

Summary

It is sometimes claimed that science refutes the Bible. This is used as support for neodarwinian evolution and to discredit the creation position. An examination of biblical epidemiology is, however, problematic for Darwinian evolution. Starting with the creation story, the Bible is full of practical advice regarding disease prevention that defies an evolutionary explanation. These recommendations include hygiene, primary prevention of disease, and dietary strategies based on the initial design, and are consistent with modern medicine.

The problem of how and why people develop illnesses in the first place remains. Science may never elucidate the complete picture for avoiding multifactorial, chronic diseases, and the molecular pathways for the complete characterization of the complex pathogenic processes may remain elusive. Therefore, the higher-level strategy suggested by edenomics is necessary. The CHM is such a program and can be instrumental in disease prevention and control. It focuses on primary prevention rather than pharmaceutical-based treatments for chronic diseases.

Although both CHM and Darwinian medicine shun reductionism, the reasons are very different. Darwinian medicine suggests that the understanding of ill health must not be based on the linear anatomical-genetic dysfunction model (Herbert, 1998). But it may not be possible to rationalize this change to a multi-factorial approach on the basis of the Darwinian concept of struggle for survival. Edenomics and the CHM, however, quite naturally support a holistic and preventive model of medicine. In the quest for greater average life expectancy that will reach maximum life span, edenomics and the CHM have more to offer than evolutionary theory.

The critical dependence of human health on plant life is not adequately explained within a neodarwinian framework. An evolutionary basis for the development of plant life involved a struggle for survival as the primary driving force of evolution. But mutation, selection, and struggle for survival make it very unlikely that plants would evolve numerous molecules not critical for their own reproductive success but highly essential for human health (Bergman, 1998). It is likewise unreasonable to assume that this balanced "garden" evolved from a primordial mixture of chemicals. A more logical conclusion is that it was designed by an intelligent Creator (Gillen 2001; Gillen et al., 2001). We are fearfully and wonderfully made (Psalm 139) and it follows directly that the Creator would provide for His creation. Health and disease cannot be separated from the Creator, the Fall, and the Creator's word. While not a science textbook, the Bible is consistent with epidemiologic principles and empirical science. Our glorious Creator has provided a wealth of natural foods for our enjoyment and these foods meet complex nutritional requirements. They work at the molecular level to prevent disease and maintain health. Finally, the Bible passages that bear upon epidemiology are accurate and insightful.

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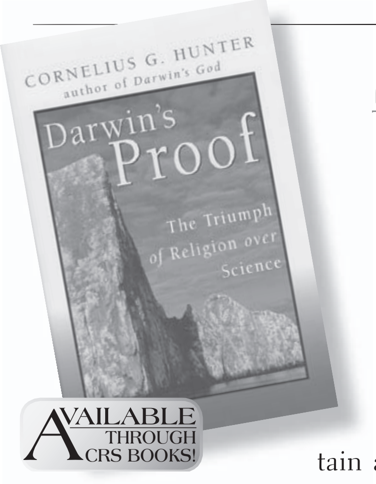
Book Review


CORNELIUS G. HUNTER
author of Darwin's God
Darwin's
Proof
The Triumph of Religion over Science
AVAILABLE THROUGH CRS BOOKS!

Darwin's Proof: The Triumph of Religion over Science
by Cornelius G. Hunter

Brazos Press (Baker Book House), Grand Rapids, 168 pages, $18.00.

In this book author Hunter argues that Darwinism is wrong on several levels. Chapters 2 and 3 contain a detailed sampling of the evidences of complexity in biology that defy naturalistic explanations. Hunter claims that since it is possible to contrive naturalistic explanations for the things we observe in biology, the plausibility of the explanations becomes critical. Mr. Hunter concludes that the Darwinist account is long on speculation and short on compelling explanations.

Chapters 4 and 5 argue against Darwinism on a second level. They show that even the positive evidence does not support evolution. Chapter 6 shows how Darwinism fails on yet another level: it is self-contradictory. Finally, Chapter 7 argues against Darwinism on the theological level. Chapters 8 and 9 argue that the biblical account is the only one that makes sense. Chapters 10 and 11 suggest that Christians conduct scientific research within the intelligent design (ID) framework. The book ends with an Appendix titled "Faulty Arguments for and against Evolution."

The unique feature of this book is Chapter 7. Hunter believes that Darwinism is inherently religious because it is based on the false notion that God either could not or would not have created the biological world biologists have discovered. Therefore Darwin was forced to conclude that life in all it forms must have evolved by chance. This explains the subtitle. Darwin's proof or reason for putting forth his theory of evolution is not found in his study of nature but rather in his non-biblical view of God. Hunter maintains that this reasoning is still the case today. While this idea is intellectually sound it is not easily and quickly communicated or followed. The general belief that science is public and objective while religion is private and subjective, coupled with the notion of the separation of church and state, makes me doubt that it will be of much help in winning the hearts and minds of the general public. I hope I am wrong.

I found Hunter's defense in the belief in *ex nihilo* and *de novo* creation refreshing. Often Christian biologists try to explain the world of living things in theistic, gradualistic, evolutionary processes. He shows that this is not necessary. The appendix of this book is as valuable as the book itself. A close study will help people recognize the false arguments made in support of evolution. It may also prevent many people from making weak or false arguments when discussing the merits of evolution.

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Conference Reports

Biola Genetics Workshop

Thirteen scientists attended the Biola Genetics Workshop (January 11–14, 2005). We believe we all experienced remarkable unity and purpose throughout our time together, without a single incidence of negativity or disrespect. All four days were filled with lively, animated discussion. We also had a good time of fellowship Monday night, Jan. 10.

Day one (1/11) was devoted to very basic aspects of information and genetic theory. In the morning, Bob Compton led us in discussion about various definitions of information, and information theory and how this applies to both an evolution and creation model of genetics. Mike Riddle then spoke to us about parallels between genetic systems and computer systems. In the afternoon, John Sanford distributed two manuscripts he is working on, and led us in discussion about the nature of mutations, human mutation rates, some of the limits of selection, and the reality of genetic degeneration over time.

On day two (1/12), we discussed the origin of various genetic structures. Kevin Anderson spoke about horizontal gene transfer and antibiotic resistance, and how neither are a viable mechanism for Darwinian common descent. Paul Gibson spoke about gene duplications, and how they fail to provide a mechanism for increased genetic information. John D. spoke about micRNA and its role in genetic regulation, and John Sanford spoke about LINES and SINES in the human chromosome. In the evening some of us attended a piano recital by Sam Rotman, a world-renowned evangelical pianist.

On day three (1/13), Andre Eggen spoke on comparative genomics, illustrating how it does not readily provide evidence of Darwinian common descent. Tim Standish spoke about the genomic differences of cryptic species of nematode and Dan Criswell spoke about antibiotic resistance in the Lyme disease pathogen. Mack L. spoke of possible alternative biochemistries of life (and their implications for design). Walter ReMine spoke about Cost Theory and how evolutionists have not been able to account for Haldane's dilemma. John Sanford spoke about the age of the genome, showing how both mtDNA and Y chromosome studies actually support a "young" chromosome. In the evening Walter ReMine shared with some of us his Biotic Message theory.

On day four (1/14), we spent the morning discussing priorities, strategies, and planning. We generally agreed there should be at least three working groups:

- **Information:** Bob Compton, Mike Riddle, (others—Werner Gitt? Royal Truman?)
- **Genetic Theory:** Walter ReMine, Paul Gibson, John Sanford (others—Ray Bohlin?, Royal Truman?).
- **Molecular:** Andre Eggen, Kevin Anderson, Dan Criswell, Tim Standish, Frank Sherwin, Mack L., John D. (others—Jerry Bergman?, Kelly Hollowell?)

Regarding these working groups, it seems that God has brought together the right core people.

May the Lord bless you all—
John Sanford and Kevin Anderson

Notes from the Panorama of Science

Revisiting Precambrian Geology

Students of Earth history may be forgiven for thinking that the major features of the Earth have been satisfactorily explained by contemporary theories. The textbooks, and especially the media, tend to side with the consensus and promote the view that the hard questions have been answered and all we have to do now is to fill in the details. The publications of research geologists, however, reveal a different picture. Sometimes concepts and models that are accepted as "standard" come under intense critical scrutiny.

A notable illustration of this is Hamilton's (2003) overview of "An Alternative Earth." This paper starts by listing seven elements of what may be described as "the conventional model of earth's evolution and dynamics" (p. 4). These are:

(1) a homogenous mantle;
(2) fractionation of this mantle material is actively taking place;
(3) continental crust has grown progressively through geologic time;
(4) convection occurs throughout the mantle;
(5) lithospheric plates are driven by mantle convection;
(6) plumes rise from the core/mantle boundary to the surface;
(7) plate tectonics has operated from early Precambrian time.

Hamilton comments: "all of these conjectures likely are false" (p. 4).

The roots of the conventional model are found in speculations about the Earth's origin: slow and cold accretion from planetisimals with heating provided by radioactive decay. Hamilton points out that this model can no longer be defended. Instead, "Earth accreted hot, fast, and violently" (p. 4), reaching two-thirds of its present size within a time span of about 10 million years. The Earth, in this new model, was repeatedly melted and volatiles would be lost while it was very young. In this revised scheme, early crustal evolution would have been rapid. Hamilton points out that Archaean crust "commonly is more felsic in bulk composition than younger crust" (p. 5) and that "observed trends are opposite to those required by the standard model" (p. 5).

A hot (molten) early Earth means that the core/mantle structure is the result of irreversible fractionation based on the density of materials. This leads to identifiable barriers to movement at depths of 2000 km, 1000 km and 660 km, because not even localised heating can change the density of materials sufficiently to form plumes or mantle-scale convection currents. The further inference that Hamilton makes is that mechanisms eroding or destroying continental crust are faster than mechanisms for its creation. The "volume of continental crust has thus decreased greatly through time. The common contrary claim that crust has grown through time drives mostly from isotopic calculations based on false assumptions of constant compositions of crust and mantle" (p. 5).

Hamilton goes on to discuss the Archaean crust, the mechanisms of Plate Tectonics, evidences relating to subduction (where he argues that there is no subduction below the 660 km barrier), and the lack of direct evidence for mantle plumes. He advocates a driving mechanism for plate tectonics called "top down subduction." This is a surface-driven process, dependent on density inversion, that is claimed to satisfy observational data (except for India). By contrast, "observed plate features and interactions… are incompatible with popular models wherein plates are colliding rafts dragged from beneath by currents flowing from hot upwellings to cool downwellings" (p. 11).

Numerous other interesting features of the Earth's geology are addressed in this paper. In his overview, Hamilton writes: "the Earth described here differs profoundly from that accepted as dogma in most textbooks and research papers. Crust and upper mantle have found a mostly closed system throughout geological time, and their dramatic temporal changes are responses to cooling. The changing processes define a Punctuated Gradualism and not Uniformitarianism" (p. 11).

It should be noted that Hamilton's alternative Earth is rooted in a chronology determined by radiometric dating, and that the "top-down subduction" model is highly controversial. The real significance of this paper is that it opens up issues for debate. The Standard Model can be challenged! There are numerous areas where academic debate is not only legitimate, it is long overdue. Hamilton's paper is a breath of fresh air and a powerful critique of the prevailing paradigm.

A further merit of the critique for us is the attention given to the Archaean. Within creationist circles, the Precambrian has suffered from neglect and this situation deserves to be changed. The diversity of views among flood geologists is enormous. Some have argued that all Precambrian rocks are created; some allow for some of the sedimentary deposits to have a pre-Flood origin; others suggest that some or all of the Precambrian rocks are linked to the Flood. By articulating some of the striking contrasts between Archaean and post-Archaean rocks, Hamilton has given us a stimulus for thought.

Interest in Archaean rocks is further promoted by the recent debate about the formation of komatiite. These unusual basalt-like rocks are distinguished by having magnesium oxide concentrations of 18–30 wt% (as compared with 10–15 wt% in most other basalts). They also exhibit, in places, distinctive olivine crystals that have interlocking spines described as “spinifex” texture. The greatest number of komatiite occurrences is in the Archaean. Fewer examples are found in the Proterozoic and only 3 in the Phanerozoic (the most recent is assigned a Cretaceous age).

Very soon after the discovery of komatiites in 1969, they were interpreted as lavas coming from an Earth that was hotter than today. This conclusion was based on laboratory melting experiments. This early research concluded that komatiites were formed at temperatures of at least 1650º C at depths of about 150 km. It was concluded that the molten rock formed in a mantle plume and then migrated upwards to become an extrusive rock.

The background to komatiites is given by Grove and Parman (2004) who summarise the majority view as follows:

> In the plume hypothesis the depth and temperature of komatiite generation decreases with time. Archaean komatiites… are the hottest, and come from the greatest depth, while Late Archaean komatiites… come from shallower depths and the youngest komatiites … come from the shallowest depths” (p. 178).

An earlier review of these rocks is by Renner (1993). She refers to these as “what were once the hottest lavas that were erupted” (p. 23). Parman and Grove (2004) write: “Eventually, plumes became the paradigm for the generation of komatiites” (p. 4 of preprint) and point out that this was the conclusion of Arndt and Nisbet’s (1982) book.

The details of the experimental work leading to this conclusion need not concern us here. However, it is important for us to realize the experiments were done without the presence of water. In 1997, a closer investigation of the mineralogy of some important komatiites concluded that, whatever their mode of emplacement, at least 3 wt% water was needed to account for their composition. Consequently, it became important to resolve where the water came from and how this might affect the mantle plume model.

Such questions have led to a shallow depth subduction environment with mantle temperatures only about 100° C hotter than at present. This model allows a link to be proposed between komatiites and boninite, a high magnesium rock produced occasionally in recent “subduction zone” environments. Although these findings represent a big step forward for understanding komatiite geochemistry, they are revolutionary for the earlier ideas of a hot Archaean mantle with a proliferation of plumes. It is almost a case of ‘back to the drawing board’!

Parman and Grove (2004) discuss the significance of the earlier view. Komatiites “are a keystone in most models of the secular cooling of the Earth’s interior” (p. 1 of preprint). However, if the new understanding is correct, there is no direct evidence for increased plume activity in the Archaean; the upper mantle temperature was 100° C above the present value (not 500° C) and models of heat generation by radioactive decay have to be drastically revised.

Grove and Parman comment: “Kuhn (1962) argues that paradigm shifts are preceded by times of confusion, heated debate and a multiplicity of hypotheses that explain differing subsets of the existing data. This description seems to provide an accurate account of the current state of komatiite research and promises an exciting future” (p. 184).

Whether it be the Archaean in general, or specific rock types such as komatiites, the picture is the same. The time is right for the emergence of new explanatory models of the basement rocks. Biblically-based geology is, we argue, the key for unlocking Earth history—and we have more reasons than any for grasping these opportunities.

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Are There Organelles in Bacteria?

Organelles are persistent cell structures having specialized functions. A novel organelle has been discovered inside bacteria, of all places! This is novel because usually bacteria do not have organelles but are themselves about as small as organelles such as mitochondria. Many workers therefore hold that mitochondria are bacteria that got inside ancient ancestral eukaryote cells and took up residence—a hypothetical origins event that is referred to as "endosymbiosis."

First seen in 1904, these bacterial organelles were not originally recognized as organelles. Later, Decampo and others rediscovered them and studied their functions (Pagen Westphal, 2003).

Work done on these organelles inside of bacteria suggests that they were not engulfed, as is believed by evolutionists to have been the case for other organelles like mitochondria and chloroplasts. These bacterial organelles originated instead from within the bacterium.

But such a discovery supports the creation of mitochondria as part of the genetic potential for each living kind, instead of having come from some other life form that got engulfed by a larger cell.

Giardia Cells Do Have Mitochondria

Concerning another aspect of organelle studies, *Giardia intestinalis* is a one-celled eukaryote that was originally thought to lack mitochondria entirely. Recent work has overthrown that idea, however, because a reduced form of mitochondria has been found in Giardia cells. These newly found Giardia mitochondria do not produce ATP—a function that is ordinarily carried out by mitochondria in other cells. Instead, Giardia makes its own ATP in the soluble phase of its cytoplasm, with the help of simple anaerobic pathways (Henze and Martin, 2003). The mitochondria of Giardia superintend the assembly of iron-sulfur clusters instead of making ATP.

This Giardia research shows that the relationship between cells, mitochondria, and ATP synthesis is not always a rigid one. All we really know about mitochondria is that they seem always to have been much as they are now—another factual support for divine creation. It is likely that Giardia's ATP has always been made in the fluid phase of its cytoplasm and not by Giardia's mitochondria, which are dedicated to a different function. However, although we have no data supporting it, we must admit the possibility that Giardia underwent a change sometime after creation—a change by which the function of producing ATP was handed over from its mitochondria to the fluid phase of it cytoplasm.

Terrance Smith and I (Smith and Brown, 1985) pointed out that the protein synthesis within mitochondria is unique and less like bacteria than was once thought. These differences between mitochondria and bacteria also militate against the common assumption that mitochondria arose from bacteria that underwent endosymbiosis.

The creation model involves the origin of many distinct "kinds" such that no change has occurred beyond the limits of these created kinds (baramin). It is assumed that each kind originally had a very rich gene pool, which we refer to as its "genetic potential." The traits of mitochondria that are similar to bacterial characteristics evidently exist because bacteria and mitochondria have been independently created that way. There is the possibility, however, that some of those resemblances may have arisen from the genetic potential of bacteria. In either case they did not arise by endosymbiosis.

Archaebacteria Have Remained Unchanged

There has been much talk about archaebacteria being very ancient, ancestral forms of life. But two sources now affirm that during the last 3.5 billion supposed years of evolution, little change has taken place among archaebacteria or other bacteria either (Woese, 1985; Denton, 1985). Such a lack of change across supposed eons of evolutionary time surely supports creation of microbiological forms and not evolution. If archaebacteria arose from the genetic potential of some earlier bacterial "kind", as is at least possible, then the theoretical changes involved must have occurred even before the fossil record was formed.

Does Any Bacterium Have Its Nuclear DNA Inside a Membrane?

Gennata obscurigobusis is a bacterium that has its genetic material encased in a membrane (Dayton, 1992). This is quite unusual because other bacteria lack a nuclear membrane and thus have their DNA directly immersed in their cytoplasm. While eukaryotes have a nuclear membrane clearly separating their nucleus from their cytoplasm, such a membrane is lacking in bacteria. Strange and innovative as this nuclear membrane is in the G. *obscurigobusis* bacterium, it is obvious that such a modification did not enable this species to take over the microbial world! This shows that bizarre or novel features do not "lead the way" to evolutionary innovation.

Acknowledgments: I thank George Howe for editorial assistance and for computer typing of this manuscript.

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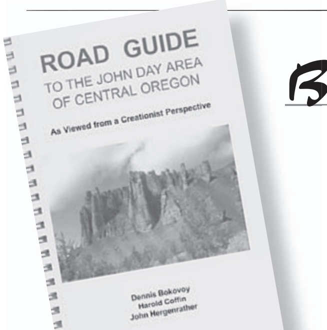

AVAILABLE THROUGH CRS BOOKS!

Book Review

Road Guide to the John Day Area of Central Oregon: As Viewed from a Creationist Perspective

by Dennis Bokovoy, Harold Coffin and John Gergenrather

Creation Research Society Books, Chino Valley, AZ. 2004, 63 pages, $8.00.

This book represents the first of a new field of publication for the society, road guides for National Parks and Monuments and other significant geological regions. Many tourists drive through areas that have magnificent scenery but often have very little idea of how the landscape was formed. Over the years uniformitarian geologists have written road guides for many states, National Parks, and specific geologic features using the "millions of years" approach. This guide employs a two-model approach to landscape formation. The uniformitarian model is compared to the Flood model in explaining the geomorphology of the John Day (JD) region of Oregon. The JD area is a rather remote section of the state. The scenery is spectacular and the geology interesting. Other creationists have discussed this region previously (Nevins, 1974).

As an example of the two-model approach, when discussing the Columbia River basalts at a particular outcrop, the authors use a diagram showing what the various successive layers of basalt should resemble if a significant amount of time has elapsed between the deposition of the layers which would expose each one to erosion for long periods of time. What is actually seen are layers laid down such that "the contact between beds is quite straight and level" (p. 12). This indicates little or no erosion between flows, exactly as expected in a young earth framework.

Four separate road trips are presented with the mileage between geomorphic features recorded. Most of the figures are in color allowing the reader to see the beauty of the countryside and aid in the identification of particular sites. Optional road trips and hikes also are suggested. Besides the geology there are discussions on the plant life, fossil beds, types of fossils found, wildlife, history, and archaeology of the JD region. The guide is well-constructed with a metal spiral binding allowing for easy usage while driving.

The Painted Hills in the region are shown which to me are more scenic than the Painted Desert in Arizona. The authors note the massive magnitude of the erosion that has occurred in the area which is similar to the erosion evident in Big Bend National Park (BBNP) in Texas. Interestingly, Sheep Rock (pp. 39-40) resembles Cerro Castellon in BBNP (Williams, 1993).

Some errors were missed when proofreading the manuscript. The ISBN number is improperly notated. Figure 21 (p. 41) cites Coffin, 1983, yet there is no such entry in the reference section. The authors are to be congratulated on the prodigious amount of work and effort that were necessary to produce such a guide. If you travel to the JD country, this guide will make your visit far more meaningful, and even if you never visit the area I urge you to obtain the book. It will educate you and your children, just reading the easily-understood guide with its excellent figures. Doing so, you will realize the defects in the evolutionary-uniformitarian model and the superiority of the young earth-Flood. The scope of material covered in this guide is amazing.

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Cataclysm Recorded in a Recent Geomorphic Event: The Gros Ventre Slide, Wyoming

Notes from the Panorama of Science

Introduction

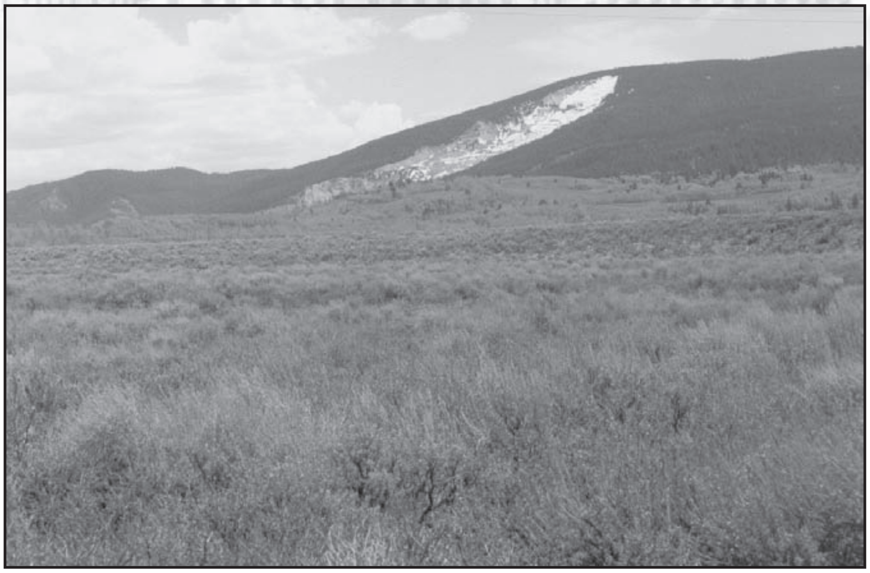

Figure 1. The Gros Ventre Slide on Sheep Mountain viewed from a distance of approximately four miles.

On June 23, 1925, the greatest historical landslide then on record in the United States occurred in the Gros Ventre (pronounced "grow vahnt") Valley of Wyoming (Smith et al., 1976, p. 62). In about three minutes, an estimated 50 million cubic yards of rock, soil, sand, silt, and vegetation slid down a spur on the northern side of Sheep Mountain (Figure 1). This quantity of material would fill a cubical container that has sides of about 1106 feet. Such a container would be about twice the height of the Washington Monument (555 feet) or approach the height of the Empire State Building (1250 feet to upper observatory). This great volume of energized material raced across the valley floor, forming a natural dam approximately 225–250 feet high, 2000 feet wide, and a mile long (Lageson and Spearing, 1988, p. 218)[Figures 2 and 3]. Continuing its momentum, some of the material went partway up the opposite valley wall and came to rest about 150 feet above the height of the dam (Voight, 1978, p. 122)[Figure 4]. The dam blocked the Gros Ventre River, forming a large lake now called Lower Slide Lake. The lake filled to about 200 feet deep and grew in length to over four miles (Figure 5). Along with several streams in the area, the Gros Ventre River (Figure 6) flows westward as a tributary of the Snake River. The Snake River has its origin in the southern mountains of Yellowstone National Park and joins the Columbia River in southeastern Washington.

Uniformitarian geoscientists debate the causes involved that contributed to the Gros Ventre Slide. Whatever forces precipitated this cataclysmic event, the fact of its occurrence provides evidence in support of the young-Earth Flood model of Earth history.

Site Location

The Gros Ventre Slide is located in Teton County in north-

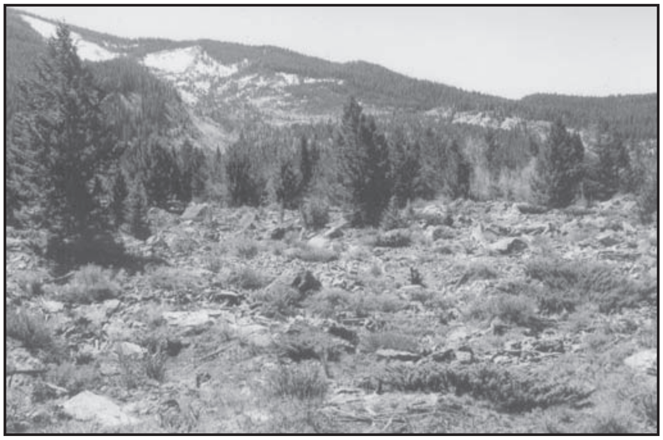

Figure 2. The rubble in the foreground is broken pieces of Tensleep Sandstone that formed the dam across the Gros Ventre River. The slide scar is visible in the background.

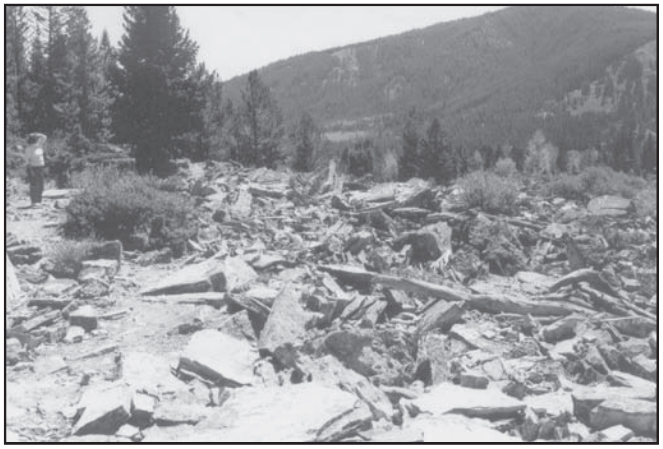

Figure 3. The Tensleep Sandstone fragments and wood debris traveled from right to left in this view as the slide dam quickly formed. Note person on left for scale.

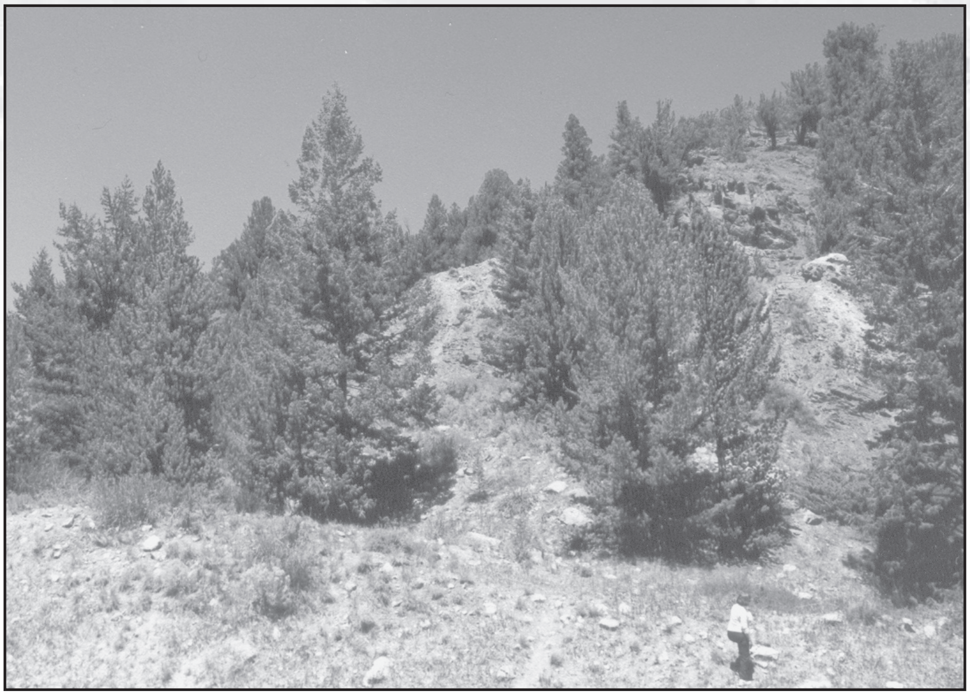

Figure 4. The slide dam is fairly level over most of its width, but momentum carried masses of rock at least 150 feet higher on the north canyon wall than the main part of the dam. Some of that rock can be seen extending about halfway up the canyon wall among the sparse, low-lying plants. The light gray color of the displaced Tensleep Sandstone contrasts sharply at its interface with the bare red strata above it. Note person in lower right for scale.

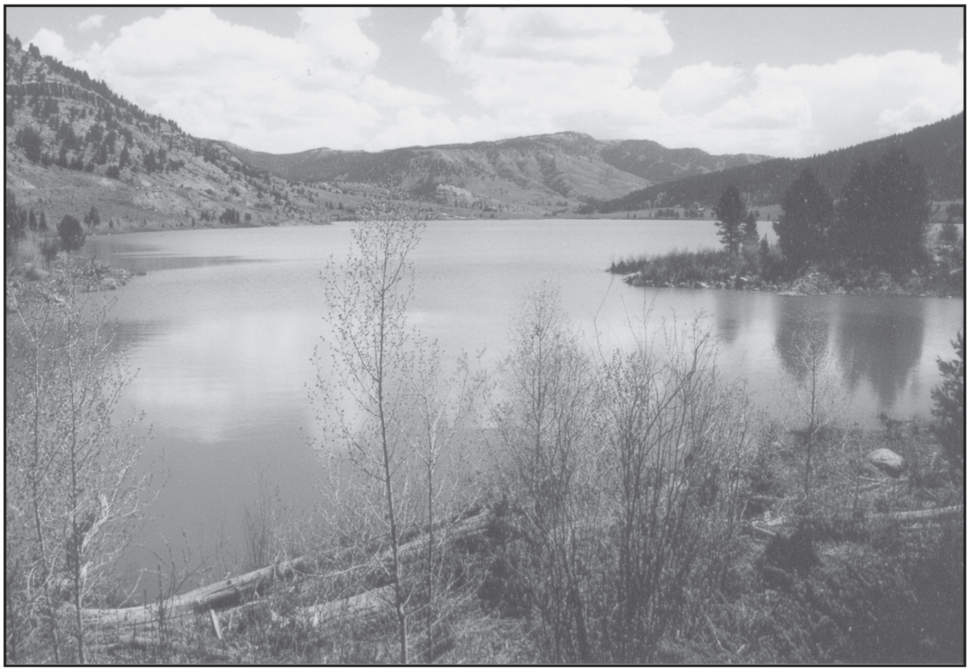

Figure 5. A view of Lower Slide Lake from atop the natural dam. The logs in the foreground probably floated there at the original lake level before failure of the dam dropped the level significantly.

western Wyoming, approximately 15 miles northeast of Jackson and four miles east of Kelly (Figure 7). The slide is on the north side of Sheep Mountain in the Gros Ventre Range, one of the mountain ranges of the Middle Rocky Mountains. The mountain is also known as Sleeping Indian Mountain because its outline resembles a recumbent Indian when viewed from Jackson. There is more than one Gros Ventre Slide with an associated slide lake. For the purposes of this paper, the Lower Gros Ventre Slide (or sometimes referenced as the Kelly Slide) of 1925 is the one discussed here.

Geology and Topography of the Site

The Gros Ventre Range is one of four types of mountains bordering Jackson Hole, a downwarp of complex folds and faults located east of the Teton Range and surrounded by several mountain ranges. The Gros Ventre Range consists of folded asymmetric anticlinal uplifts with Precambrian cores and reverse or thrust faulting found along its steep flanks (Behrendt et al., 1968, pp. E9–E10). The Gros Ventre Slide is located in the Gros Ventre Valley, which incises a homoclinal, north-dipping sequence on the side of a tilted basement block (Voight, 1978, p.122).

Located on the northeastern flank of the Gros Ventre Range, Sheep Mountain is an uplift of Mississippian Madison Limestone lying on tilted basement rock (Lageson and Spearing, 1988, p.218). Resting with erosional unconformity

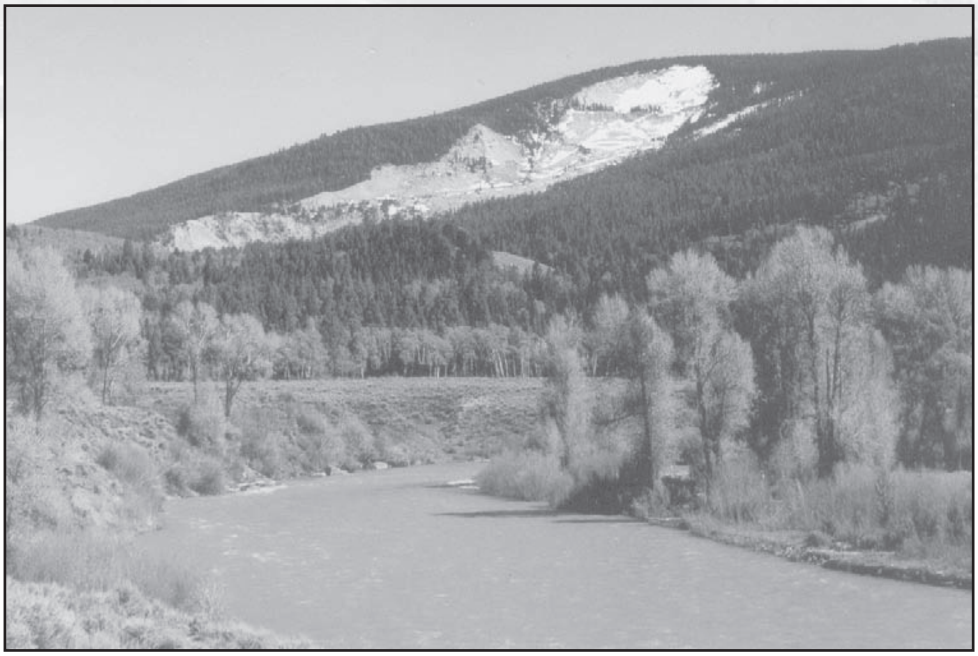

Figure 6. The Gros Ventre River viewed downstream from the slide. Snow is visible in the slide scar during late May when the photograph was taken.

on paleo-karst of the Madison Limestone are the dolomite, red shale, and sandstone strata of the Mississippian-Pennsylvanian Amsden Formation. The Pennsylvanian Tensleep Sandstone conformably and transitionally overlies the Amsden Formation (Voight, 1978, pp.122–123).

When the two formations are viewed as a unit, four lithologic divisions have been noted within the Amsden Formation and Tensleep Sandstone. The basal structure is composed of a sequence of weak sandstone and red shale that form the zone of earth materials thought to be related to the slide events. Interbedded strata composed of a red shale and siltstone unit with thin beds of fine-grained quartz sandstone and limestone can be seen in the head scarps of the slide. Above this basal structure lies a 200-foot thick series of cross-bedded sandstones and quartzites overlain by a thinner zone of cherty limestone. On top of this is a cross-bedded and ripple-marked sandstone that is massive and becomes more shaley at its upper extreme before grading into the base of the dark shale of the overlying Phosphoria Formation (Voight, 1978, p 123).

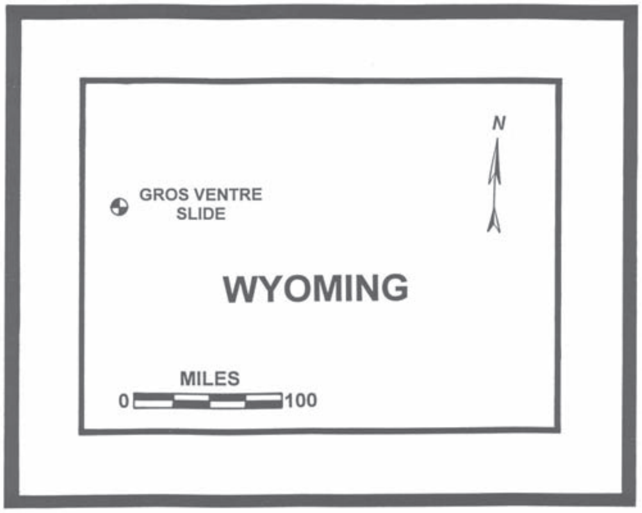

Figure 7. Location of the Gros Ventre Slide in Wyoming. Drawing by Mary Elizabeth Akridge.

The slide was facilitated by the physical condition of the rock in the locality. Ledges of resistant sandstone formed a cap near the top of Sheep Mountain. Underlying this durable sandstone were less competent beds of siltstone, sandstone, and sandy shale that had yielded large quantities of sand and silt with lesser amounts of silty clay (Voight, 1978, p.123).

The strata in the vicinity of the slide dip toward the valley at 20º on the north side of Sheep Mountain (Voight, 1978, p.122). The spur of Sheep Mountain hosting the slide has a maximum elevation of approximately 9200 ft. The slide originated at an elevation of 9025 ft. and terminated at the bed of the Gros Ventre River that had an elevation of 6800 ft. at the time of the event. The vertical relief of the slide is now approximately 2100 ft. and its footprint stretches 8505 ft. (or 1.6 miles) (Voight, 1978, p.150).

Two Current Interpretations of Slide Events

The Popular Interpretation

According to Lageson and Spearing (1988, pp. 218–219), the slide resulted from a combination of four conditions: 1) the sedimentary strata in this area dip 15º to 20º toward the Gros Ventre River; 2) the sandstone strata of the Tensleep Formation overlie a slick shale layer; 3) the Gros Ventre River had undercut the sedimentary strata along its channel, causing the strata to lose footing support; and 4) several weeks of heavy rain and a late snowmelt saturated the soil and penetrated the bedrock, thus making the shale layer more slippery by reducing the frictional coefficient between the bedding planes.

In concurrence with these conditions that existed in the area, an earthquake tremor occurred on June 23, 1925. As a result of being shaken, the Tensleep Formation could not maintain its inclined posture on the underlying slick shale, and with inadequate footing to hold it back, the mass of rock slid down the mountain. From their interpretation, Lageson and Spearing (1988) write that this mass wasting event is better labeled a rockslide than a landslide.

Another Interpretation Incorporates Additional Factors

Although inconclusive, seismicity in this region may provide an additional factor relating to landslide activity. For several years prior to the 1925 slide, earthquakes were more common in the Jackson Hole area than at present. According to eyewitness accounts, there was an increase in seismicity before and after the 1925 slide event (Smith et al., 1976, pp. 57–64). A local earthquake reported to be a magnitude ≤ 3.5 event (as estimated from its intensity) occurred the evening before the slide (Voight, 1978, p. 126).

Geologist Barry Voight (1978) has conducted possibly the most extensive investigation of the slide. The following is a summary of his work:

> Voight (1978, p. 113) provides a reasonable interpretation of possible events that may have caused the slide as a result of seismic activity. He suggests that complex causative agents were involved in the slide, such as: 1) a 2100 ft. high valley slope with sides nearly parallel to the strike of beds that dip about 20° toward the floor of Gros Ventre Valley; 2) an inhomogeneous rock mass that was highly-leached, weathered, weak, highly porous, and particularly permeable parallel to bedding planes; 3) an undercut toe buttress along the river; 4) the combined effect of heavy snowmelt and precipitation antecedent to the slide; and 5) one or more shocks by earthquakes.
>
> Voight states that the popular interpretation of the slide involving slippage of a massive sandstone block on slick, underlying clay seems inaccurate. Instead, he proposes that seismic activity triggered underlying pockets of sand into liquefaction and initiated progressive and accelerating creep strains in adjacent material. The hydrodynamically activated creep strains ultimately caused failure of the rock structure and resulted in catastrophic mass movement.
>
> According to Voight (1978, p. 155), the geometry of the slide scar and the rapidity of the slide itself indicate that the slide mass apparently behaved much like a fluid. Further support for this view is seen in the concave cross-sectional profile of the slide scar, the disaggregated condition of the debris involved in the slide, and by actual eyewitness accounts of the slide. From this, Voight indicates that rather than being classified as a rockslide, perhaps a better argument can be advanced for its being termed a debris-slide or debris-avalanche.
>
> In support of his premise, Voight writes that almost the entire area included in the 1925 slide is contained within another earlier slide complex. Because of the 1925 slide having occurred as at least a secondary event, Voight interprets the slide area as involving reactivation of material that had already been previously displaced.

Effects and Aftereffects of the Slide

During the devastating slide on June 23, 1925, the kinetic flow of slide debris was fluid-like as it raced down the north slope of Sheep Mountain. The energy was such that the slide material did not just stop at the valley floor, but also surged up the opposite canyon wall about 400 feet. After the dust cleared, the resulting natural dam was found to be 2000 feet wide, 225–250 feet high, and extended one mile along the river channel, blocking the Gros Ventre River (Lageson and Spearing, 1988, p. 218). The dam is remarkably level and flat-surfaced, with the only exception being the rock debris that piled up on the north canyon wall higher than the main part of the dam (Figure 4).

After being obstructed by slide debris, the Gros Ventre River rapidly formed a lake behind the dam. At first, water seeped through the dam and did not allow the lake to overflow its top (Voight, 1978, p. 118). Scientists, engineers, and geologists studied the slide and concluded that the dam was permanent and safe. The spring runoff of 1926 passed with no problem, giving the local residents a sense of security. However, the winter of 1927 proved to be the most severe one recorded in Wyoming until that time. With the coming of spring, the unusually deep snowpack melted rapidly while being accompanied with many days of rain (Teton Science School and Bridger-Teton National Forest, 1993).

Water from these sources caused a rapid rise in lake level allowing water to overtop the dam on May 18. Partial failure of the slide dam occurred, causing the lake level to be lowered about 50 feet in a short time frame. This resulted in approximately 78.5 million cubic yards of water rushing through the Gros Ventre Valley. When the water traveled about 3.5 miles downstream and reached Kelly, the town was destroyed with a 16-foot high wall of water that also caused six deaths. The influx of water into the Snake River caused it to rise as much as 50 feet, extensively damaging the town of Wilson about 21 miles distant. As the water reached more than 100 miles away along the Snake River, resultant flooding occurred at Idaho Falls, Idaho (Voight, 1978, p.118).

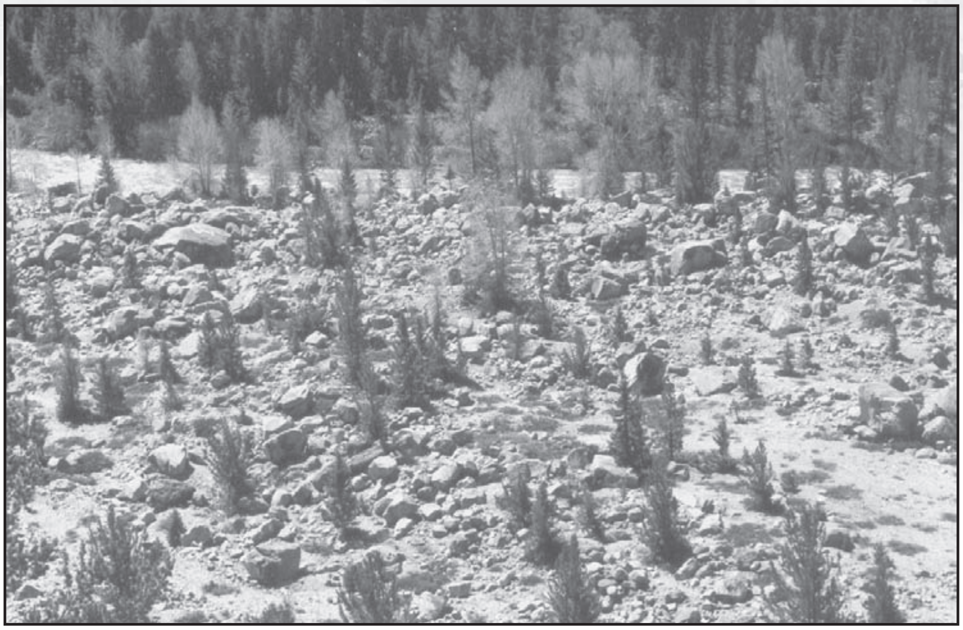

Figure 8. Boulders of various sizes that were moved downstream by the powerful water current after failure of the slide dam. The Gros Ventre River is visible near the top and flows to the right. Imbrication of many of the rocks indicates the direction of powerful current flow after failure of the dam. Some of the larger boulders that were moved downstream from the slide dam are 15–20 feet in diameter.

We observed few remaining signs of the flood's damage near Kelly since more than 75 years have passed since the catastrophe. The small town has been rebuilt since the devastation. The post office that had once been a church at the time of the flood and possibly one other building are the only original structures remaining. However, the huge boulders carried downstream after failure of the slide dam remain as a testimony to the awesome power of the floodwater. Here we saw boulders with diameters as much as 15–20 feet that were transported and deposited by the flood (Figure 8). In imagining the tremendous forces that obviously were required for the energetic water to move the massive volume of large rocks, we thought about how much more energy had to have been involved in the global Flood of Genesis. Although highly destructive and locally encompassing, the Gros Ventre flood was a minor event compared to the Noahic Flood.

The Slide Event Provides Support for the Young-Earth Flood Model of Earth History

According to uniformitarian reasoning, the Rocky Mountains were uplifted during the Laramide orogeny. This period of mountain building began in the late Cretaceous Period and continued into the early Eocene Epoch. Subduction of oceanic crust paralleling the western margin of North America caused compression of the Rocky Mountain region. This process of the North American Plate being subducted by the Pacific Plate resulting in formation of the Rocky Mountains is called "plate tectonics"[1] (Lageson and Spearing, 1988, pp. 11–16). Thus, the Gros Ventre Range was born from this process, according to uniformitarian belief.

The Gros Ventre Range in the Middle Rocky Mountains is between 50 and 60 million years old by uniformitarian thought (Lageson and Spearing, 1988, pp. 210, 217). The empirical evidences clearly displayed in this area appear to seriously damage the idea of an ancient age for the Gros Ventre Valley and Sheep Mountain in the Gros Ventre Range. Why does this area still experience landslides if the sloped strata and other geomorphic features are more than 50 million years old? It would seem that over such a period of time, the landscape would have reached equilibrium so that landslides would not be occurring at all.

In the huge time frame purported by uniformitarian assumption, erosional processes coupled with mass wasting events would have probably flattened the high relief and sloped strata common to the mountains of this area. With those sharp features reduced to no more than gentle undulations in the terrain, mass wasting phenomena should be mostly absent.

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[1] Plate tectonics is a theory of global tectonics regarding the interaction of torsionally rigid bodies (plates) at their boundaries where tectonic and seismic activities occur (Bates and Jackson, 1984, p. 389). Although many uniformitarian geoscientists address the issue of plate tectonics as fact, others such as Flint and Skinner (1974, pp. 365–366) give a word of caution regarding plate tectonics. This theory seems to provide answers to so many questions that it appears to be a unifying theory explaining the lithosphere. As objective scientists, they indicate that carefulness is necessary because it remains an unproven theory and subject to change as new data are discovered.

Based on experiential evidences, the young-Earth Flood model provides a superior interpretation of the history of this area that was affected by such cataclysmic mass wasting events.[2] We postulate that the sedimentary strata found covering this region were probably deposited during the Flood and that the Rocky Mountains were uplifted during the time[3] of the Flood and subjected to post-Flood adjustments.

Conclusions

Based on the number of landslides we observed along the Gros Ventre River in the Gros Ventre Valley, the possibility for future landslide activity appears likely. Enhancing this potential for major landslides is a combination of factors inherent to this region. We observed steep slopes and incompetent surface materials with some areas further weakened by unconsolidated glacial deposits.

Another factor affecting the possibility of landslides in this area is the annual precipitation of approximately 24 inches, with about three-fourths of this being in the form of snowfall (University of Wyoming National Park Service Research Center, 2003, p.1). Rapid snowmelts can cause increased groundwater activity during spring thaws. Underlying many of the strata on the steep mountain slopes are shales and clays that are generally impermeable to water and can have high pore pressure during periods of excessive hydration. Under such conditions, the cohesive bond decreases between the slippery, wet layers and the overlying steep strata, increasing the likelihood of mass wasting events. In concert with this effect are the unconsolidated sands and other sediments within the strata that are subject to liquefaction during seismic events. Liquefaction of sediments beneath overlying, sloped strata provides a catalyst for mass wasting events.

Surface strata can be weakened by congelifraction, or freezing of water, within cracks, pores, and along bedding planes within strata. This action is probably amplified by several cycles of the melting and refreezing of water from the snowpack each spring. The melted snow will weaken strata by penetrating them, refreezing, and causing breaks within the rock structures, thus making them susceptible to mass wasting events.

The potential for earthquake activity in this area remains high. Within six miles of Kelly, 25 earthquakes were reported between 1986 and September 2001. At least 31 earthquakes of magnitude 2.0 or greater were recorded as having occurred within three miles of Kelly during the first four months of 2002 (Stark, 2002, p.1). Earth tremors can possibly trigger landslides aided by other factors that are in coincidence. Even though most of the local tremors have been minor ones, a small earthquake nearby can be as much a trigger for a landslide as a large earthquake much further away. While our study was under way, the largest earthquake ever recorded in Teton County, a magnitude 5.0 temblor with accompanying aftershocks, rattled this area during the early morning hours of January 7, 2004. The earthquake and its three aftershocks, measuring 3.7, 4.1, and 4.0, were centered near Lower Slide Lake. A few days before this temblor occurred, another one of magnitude 3.5 struck nearby on December 30, 2003 (Stark, 2004, p.1).

The Gros Ventre River has eroded below the basal planes of some of the northerly dipping strata along its channel. Thus, the strata have lost the necessary toe resistance to maintain structural integrity during times when additional factors increase the likelihood of slides.

Many of the geomorphic features of this area remain in a state of disequilibrium, which enables the occurrence of mass wasting events to help bring the geologic forces into equilibration. The degree of each of the simultaneously occurring topographic, geomorphic, environmental, and seismic factors within a certain area will affect the magnitude of any particular mass wasting event. Because most or all of the factors discussed above are present at various times and locations in the Gros Ventre Valley, we predict that future landslide activity is highly probable in this region and predictable by the young-Earth Flood model of Earth history.

Appendix

A bear hunter and prospector named William Bierer once owned the land on which the Gros Ventre Slide later occurred. He had observed flowing springs high up on the slopes of the mountain with one making a swampy pool with no obvious outlet. In speaking with a friend and neighbor, Bierer said that he could hear water running underneath the ground anywhere on the slope. Bierer speculated that the water from high on the slope ran through the strata and came to the surface at some other point. He predicted that during a particularly wet season, the wet strata underneath the slope would turn loose and the strata would slide down the mountain in coincidence with frequently occurring earthquakes in the area. Bierer's prediction came true some 10 to 15 years after talking about this to his friend. In 1920, Bierer sold his land to rancher Thomas Guilfoyle Huff (Voight, 1978, pp. 114–116).

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[2] See Akridge and Williams, 2001, and Williams, 1996, for additional information regarding similar mass wasting events and how they support the young-Earth Flood model.

[3] For discussion of a creationist geological timescale, see Froede, 1995; 1998.

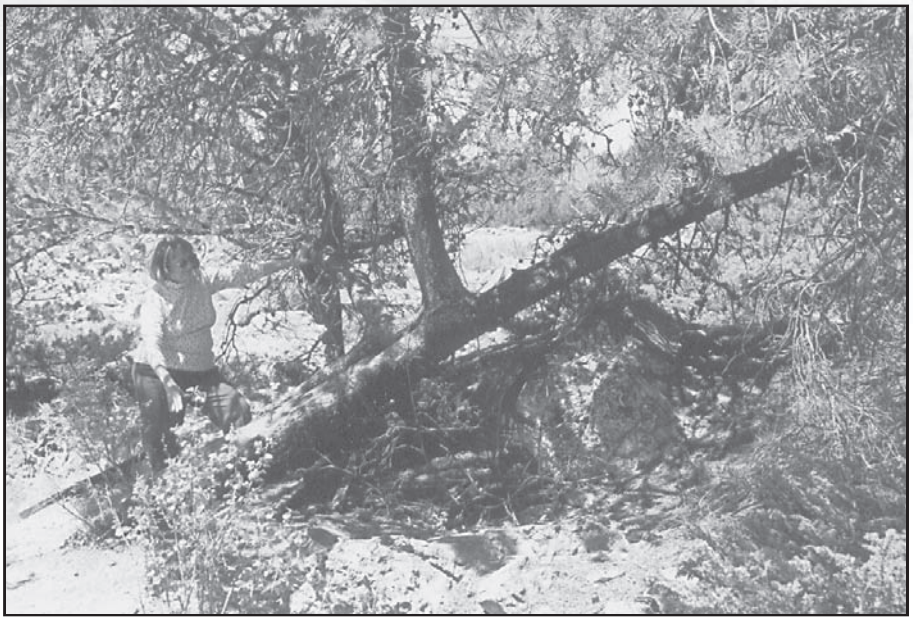

Figure 9. This tree traveled with the slide debris down the mountain and was transplanted from a higher elevation. The trunk of this lodgepole pine leans sharply to the right and one of its limbs has grown upward and attained a greater diameter than the upper trunk. Although this tree was displaced by the slide in 1925, it has not grown much probably because of root damage from the slide, a stressful change of its environment, and less than optimal soil conditions at the new location.

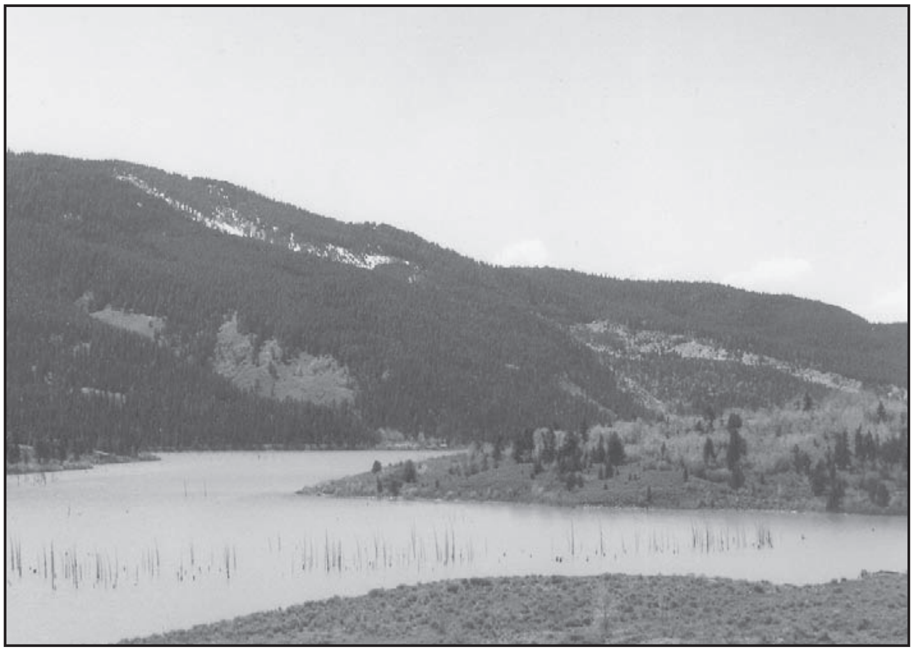

Figure 10. Lower Slide Lake with the slide scar visible in the far background from near the top of Sheep Mountain to about the lake level. The snags remain from trees that were flooded by the lake that formed from damming of the Gros Ventre River by the slide.

On the afternoon of June 23, 1925, Huff heard loud rumblings coming from his ranch on the north side of Sheep Mountain. At about 4 p.m., he mounted his horse and rode down the Gros Ventre River to investigate the noises. On arriving at the site, he was greeted by 50 million cubic yards of the mountain rapidly descending toward him. Huff turned the horse and galloped as fast as possible, resulting in the onrushing debris narrowly missing him and his horse by about 20 feet. Three other men, Forney Cole, Bob Seaton, and Boyd Charter, also witnessed the catastrophe. In just minutes, 17 acres of Huff's ranch and Bierer's old cabin were buried in the rock debris. The new ranch house built by Huff was undamaged, but in a few days floated away in the lake formed behind the slide. Huff, his wife, and daughter escaped with their lives (Teton Science School and Bridger-Teton National Forest, 1993).

An air-blast possibly preceded the rapidly advancing leading edge of the slide. Rancher Forney Cole had just driven a cow across the Huff bridge on the Gros Ventre River. As the cow barely cleared the bridge, the force of air ahead of the slide moved the bridge upstream in the valley.

Other effects demonstrated the power of the moving rock. The Gros Ventre River was lifted from its channel by the leading edge of the slide and smashed against the cliffs of the north canyon wall to a height of 50 feet or more above the slide debris. Once the slide debris reached the river, the force of the moving mass generated a wall of water that traveled upriver a mile further than the easterly terminus of the slide material.

As the southern edge of the debris reached the Huff ranch, much of its energy had been expended. It was then that Huff found and dug his bull and a calf out of the debris. Because they were apparently alive, this suggests a low velocity of the slide debris at its terminus. Amazingly, a man who was plowing fields on the Huff ranch continued to do his work as the slide occurred (Voight, 1978, pp.145–146).

Much of the forest that had been on the slope of Sheep Mountain rode the slide down the mountain. According to eyewitnesses, the trees rocked convulsively until coming to a stop in the valley. Some were transplanted at odd angles in their new location and continued to live until now (Voight, 1978, pp.148–150)[Figure 9] The newly formed lake completely covered many of the trees that grew along the pre-slide Gros Ventre River. Some at higher elevations were flooded and their snags can still be seen standing in the water (Figure 10).

Such a colossal natural event is hard to imagine and staggers the imagination. W.O. Owen, a State Surveyor, came up with an interesting comparison. He estimated that if those who constructed the Panama Canal had moved earth at the same rate as the Gros Ventre Slide, the entire project could have been completed in less than an hour (Lageson and Spearing, 1988, p.219).

Today, the serene and scenic setting at the Lower Slide Lake belies the cataclysmic activity recorded there over three-quarters of a century ago. Through studying this catastrophe, we can better understand similar forces that were unleashed during the Noahic Flood as well as find evidence that places the Flood within the time frame postulated by the young-Earth Flood model of Earth history.

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Letters to the Editor

Comments on "Epidemiology and the Creation Health Model"

I read with interest Dr. Schragin's article in the December 2004 issue of *CRSQ* (p. 1185) on the Creation Health Model and would like to suggest an additional factor for his consideration: alignment with God. Science is only beginning to understand the role that the mind has on our health. Yet, the Bible clearly states that our spiritual state effects our health. As Dr. Schragin points out, the Fall was the time in which disease and death entered the world. As a result, it follows that sin and disease are related. If so, eliminating sin from our life should result in less disease and improved health. There are numerous scriptures that confirm this. Proverbs 3:1–2 (NIV) says "My son, do not forget my teaching, but keep my commands in your heart, for they will prolong your life many years and bring you prosperity" and Proverbs 3:7–8 (NIV) says "Do not be wise in your own eyes; fear the Lord and shun evil. This will bring health to your body and nourishment to your bones."

Homeostasis is a state of balance. Our sin can cause our bodies to move out of homeostasis and produce a physiological reaction. An example of this is fear. Fear and its physiological "fight or flight" response is intended to protect us from dangerous situations and briefly boost the body's performance. However, when we allow fear to take up residence continually in our lives, homeostasis is permanently disrupted and health problems, such as high blood pressure ensue. Examples of this type of continual fear are: phobias, fear of failure, rejection, confrontation or general worry. This type of fear is the opposite of the faith God requires of us. Fear does not come from God. 2 Timothy 1:7 (KJV) states, "For God hath not given us a spirit of fear, but of power and of love and of a sound mind." Simply put, fear is sin, and sin can effect our health. Drawing closer to God and eliminating fear and other sin from our life leads to improved health. God promises us. An additional source of information on the subject of our health and the connection to sin is a book entitled *A More Excellent Way* by Henry Wright.

I would suggest that Dr. Schragin consider an additional component to the CHM that takes into account the connection between mind, body and spirit. Scientific evidence suggests that our thinking is an important component to our health which is consistent with a Creator who has designed us to be in fellowship with Him.

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The article "Epidemiology and the Creation Health Model" by Jeffery G. Schragin published in the December 2004 *CRSQ* (p. 185) presents an admirable and worthwhile framework for a Christian to follow. He suggests that we maintain a diet and lifestyle that is in line with God's original design, which will lead to better health and a reduced probability of disease. Having an understanding of health and disease from a Biblical perspective and making diet and lifestyle choices based on Biblical principles can only be beneficial. However, one of the recommendations of the Creation Health Model is "meat eating should be minimized or eliminated and fats avoided. All processed foods should be avoided." The last statement regarding processed foods is certainly one to be followed, as there is overwhelming evidence of the harms of processed foods, and these foods are not a part of God's original design of man's diet. However, the recommendations regarding the avoidance of meat and fat, if strictly followed, can be very hazardous to one's health. To support his recommendation to avoid fats, Schragin states that "cholesterol and saturated fat intake are directly related to the risk of coronary heart disease." He recommends reducing the intake of saturated fat and increasing the consumption of fruits, vegetables, and whole grains for a healthy heart. In stating this, he overlooks a large body of research that has shown the opposite—that meat and natural fats are vital to a properly functioning body, and that saturated fats do not increase the risk of heart disease.

Certain types of fats found in natural foods are known to be beneficial to health. For example, human milk is very high in fat (especially saturated fat) and cholesterol. The chemical development of the brain is dependent on the proper concentration of fatty acids, and cholesterol is extremely important for the development of the enzyme systems and the central nervous system (Douglass, 1984). Saturated fats play an important role in body chemistry. To name just a few: Saturated fatty acids constitute at least 50 percent of the cell membrane, giving them necessary stiffness and integrity (Fallon, 1999). They aid in the incorporation of calcium into the skeletal structure (Simopoulos and Salem, 1992). They protect the liver from alcohol and other toxins (Nanji et al., 1995). They enhance the immune system (Kabara, 1978) and have antimicrobial properties, protecting the digestive tract against harmful microorganisms (Fallon, 1999). The scientific evidence does not support the assertion that saturated fats cause heart disease. The cause of heart disease is not animal fats and cholesterol but rather a number of factors inherent in modern diets, including consumption of vegetable oils and hydrogenated fats, excess consumption of carbohydrates in the form of sugar and white flour, mineral and vitamin deficiencies, and the disappearance of antimicrobial fats like animal fats and tropical oils from the food supply (Fallon and Enig, 1996). The Creation Health Model correctly recommends that these processed foods be eliminated, but fats that occur naturally should not be tossed out with them. Meat contains important vitamins, such as vitamin B-12, vitamin D, and vitamin A. Eating a strictly vegetarian diet can cause a deficiency of these important nutrients, which can lead to serious health problems.

The contention that a diet low in saturated fat actually reduces death from heart disease or in any way increases one's life span has not been irrefutably proven, and in fact there is little evidence to support such a claim. Before 1920, heart disease was rare in America. During the next 40 years, the incidence of heart disease rose dramatically, and by the mid-1950s heart disease was the leading cause of death among Americans. If heart disease has been caused by the consumption of saturated fats, one would expect to find a corresponding increase of animal fat in the American diet. In fact, the opposite is true. From 1910 to 1970, the proportion of animal fat in the American diet declined from 83 percent to 62 percent, and butter consumption fell from 18 pounds per year to four. During the same period, the percentage of vegetable oils in the form of margarine, shortening, and refined oils increased about 400 percent, and the consumption of sugar and processed foods increased about 60 percent (Enig, 1995).

Societies that have diets that are very high in fat often have a low occurrence of heart disease. It is only in industrialized nations where diets consist of high levels of processed foods that heart disease is a serious problem. The research of Dr. Weston A. Price on isolated nonindustrialized peoples determined the optimum characteristics of human diets. Though an evolutionist, much of Dr. Price's findings would fit well into a dietary model based on God's design in nature. He demonstrated that a diet of nutrient-dense whole foods and the vital fat-soluble vitamins found exclusively in animal fats can lead to optimum health (Price, 1945). He advocated a diet high in whole grains, raw whole milk, meat from organic pasture-feed animals, fish, some fruits and vegetables, and free of processed foods such as sugar and white flour. Numerous studies of traditional populations have also shown that those peoples with a diet high in saturated fat have a low occurrence of heart disease and have a long life span (Kang-Jey et al.,1971; Mann et al., 1962; Willett et al., 1995; Perez-Llamas et al., 1996; Alberti-Fidanza et al., 1994; Pitskhelauri, 1982). For example, the Japanese have the longest life span of any nation in the world. Their diet contains moderate amounts of animal fats from eggs, pork, chicken, beef, and seafood. They do not consume a lot of vegetable oil, white flour, or processed food. Switzerland, Austria, and Greece, the three countries after Japan with the longest life spans, have high fat diets. The French diet is full of saturated fat in the form of butter, eggs, cream, cheese, liver, and meats. Yet the French have a lower rate of heart disease than many other western counties. Eskimos in nonindustrialized areas eat blubber and raw fish, but they have little heart disease.

It is clear from the Bible and from design that God intends man to eat meat, though that may not have been the intent of His original perfect creation. God gave us every living thing as food, along with plants (Genesis 9:3). When Peter had a vision of a great sheet filled with animals, God says to him, "Get up, Peter, kill and eat" (Acts 10:10–13). In I Corinthians 10:25–26, Paul says "Eat anything that is sold in the meat market without asking questions for conscience sake; for the earth is the Lord's, and all it contains." In I Timothy 4:1–4, Paul warns Timothy about those in "latter times" who will be "speaking lies in hypocrisy; having their conscience seared with a hot iron; forbidding to marry, and commanding to abstain from meats, which God hath created to be received with thanksgiving of them which believe and know the truth." Several times in Exodus, Leviticus, Deuteronomy, and Numbers, God describes His promised land for the Israelites as a land flowing with milk (which is high in fat) and honey. And God's design of human teeth, with a combination of canines, incisors, and molars shows that He intended man to consume both meats and vegetables. Our digestive tract contains ferments for both meat proteins and carbohydrates.

God's design is apparent in His creation of plants and animals that are critical to human health. As Schragin points out, the evolutionary theory is inadequate to explain such perfect design. We should certainly strive for a diet and lifestyle in line with what God intends for humans. Since God has given humans meat and plants as part of a complete diet, the Creation Health Model should incorporate a moderate amount of meat and fat.

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Schragin responds to both letters

I would like to make three points then discuss the specific comments made in each of the letters. First, any discussion of nutrition and human health is made with incomplete knowledge. Science is just beginning to appreciate the complexity of nutrient-gene-environment interactions. Advances in molecular biology such as genomics and proteomics have led to the emerging field of nutritional genomics or nutrigenomics, a field which demonstrates the immense complexity of the interactions, combinations of interactions, and synergisms of nutrients and the human body. In an upcoming paper, I introduce the term edenomics to describe the potentially intractable nature of these interactions. Edenomics, briefly defined as the intersection of Genesis 1:27, 1:29, and molecular biology, recognizes that the apparently simple sounding statements of Genesis 1 describe incredibly complex molecular events. The biochemistry of only one herb, garlic (Bannerjee et al., 2003), reveals this complexity.

Theories of health and human diet are currently constructed on only a partial understanding of an amazingly ingenious design by the Creator. Browsing the local bookstore reveals shelf after shelf of books purporting dietary solutions to health problems or the most favorable diet. Books and articles frequently contain somewhat confusing and contradictory recommendations. Extant science has only a rudimentary knowledge of nutrient-gene-environment interactions. Consequently, discussions of the best possible diet for health at this point in time rest on somewhat theoretical constructs.

Second, the goal for human health in a fallen world plagued by death and sickness requires delineation. Christ overcame death and, ultimately, it may not matter if a person lives 60, 80, or 120 years. Observations of human nature, however, indicate that people desire to live long and healthy lives. To that end, a reasonable goal is an average life expectancy of 120 years with a minimum of morbidity and disability. Scripturally and scientifically, this goal is realistic and attainable. It requires the judicious use of primary prevention of disease including behaviors and dietary choices, secondary prevention of disease using medical technology, medical and surgical treatments, public health measures, and agricultural advances.

Third, the Creation Health Model (CHM) is an incremental probability model with diet a major component. Modification of diet may be the most important aspect of lifestyle, especially in persons who do not have unhealthy habits such as smoking. A total animal-product-based diet exists on one end of the CHM dietary spectrum. A person at this extreme would not be expected to do well since that diet lacks vital nutrients from plant life. Vegetarianism lies at the other end. The prefixes ovo-, lacto-, and pesco- specify the well-known types. In the upcoming paper, I introduce the prefixes lepto-, meso-, and platy-, to further differentiate vegetarianism with respect to the breadth and depth of a plant-based diet. A platy-vegetarian—a person consuming a very wide variety of plant-based foods—can do well, meeting nutritional requirements with due diligence (ADA, 2003). Obviously, most persons fall between the two extremes, with the optimal place between the ends unknown.

The Fall introduced sickness and death into the world, which did not exist in the original design. Nutrition science currently attests to the necessity of plant life for optimal human health. This strongly suggests at least some connection to the garden remains in this post-Fall, post-Flood world and the CHM assumes as much. Using the state of no disease as the reference point for analysis seems reasonable. As a result, the CHM has the presumed pre-Fall conditions as the starting point for the incremental deviations that result in increasing probabilities of disease. For the dietary aspects of the CHM, a plant-based diet represents the baseline for assessing lifestyle activities affecting health and disease.

Now I will address some of the specific comments. Zimmerman brings up further issues of incomplete medical understanding such as mind-body-spirit interactions and wellness. The CHM does imply a certain "walk" with the Creator that takes into account some of the suggestions in this letter. Quantifying the health value of spiritual contentment remains difficult. Likewise, the effect of prayer may be hard to measure accurately. Many psychological and spiritual aspects of health exist, which need investigation. More research in these areas will inevitably lead to additions to the model.

If sexual promiscuity or excessive smoking or overindulgence in drinking or drug abuse are considered sin, then these activities are consistent with the CHM in an incremental-probabilistic, dose-dependent manner. The more that an individual takes part in these behaviors, the higher the likelihood of an unhealthy outcome.

It should be pointed out that the listed elements of e1 and e2 in the introductory CHM paper are not complete. The list will change with time and further research. The paper attempted to set a framework for understanding health and disease from a creationist perspective. Some of the items suggested by Zimmerman may be included in additions and modifications of the e1 and e2 components of the model.

The letter by Schneider reiterates concerns regarding the need of animal products in human nutrition and health. As pointed out, the ADA (2003) states that a carefully planned vegetarian diet can attain complete nutrition. Vitamins A, D, and B12 are very important nutrients. Vitamin A, however, can be toxic in large amounts from animal sources. The body does not have the capability to eliminate excess and stores it in the liver. Beta-carotene, a vitamin A precursor, is non-toxic even in large amounts. It is converted into vitamin A as the body needs with excess beta-carotene harmlessly eliminated. The difference between hypercarotenosis (benign) and hypervitaminosis A (potentially quite toxic) is significant (Tierney et al., 2001). Plant foods contain beta-carotene and may be a much better source of vitamin A. Sunlight exposure and minimum amounts of fish, milk, or eggs can provide adequate vitamin D. Vitamin B12 is needed in very small amounts. The liver stores B12 and deficiency requires a very long period of abstinence from animal products. Small amounts of milk, eggs, or supplements avoid the problem. Recommendation for moderate meat consumption based on these three nutrients is not warranted.

Discussions regarding the design of teeth remain somewhat controversial (Catchpoole, 2000; Morris, 1997). We do not know pre-Flood plant composition and distribution. Without that knowledge, discussing the design of teeth becomes speculative. The functions of teeth described in the letter may be suitable for eating pre-Flood plant life. Even if the omniscient Creator, who knew the future, designed teeth for the meat eating purposes suggested, implying moderate or large amounts of meat does not necessarily follow.

It is hard to argue for a health benefit from animal fat which inevitably accompanies meat. Plant foods contain needed essential fats. Heart disease has been linked to animal fat; however, other health concerns exist in addition to cardiac disease. Some cancers have been linked to animal fat (Cohen, 2002). Several case-control studies associate diets high in animal fat and cholesterol with Parkinson's disease (McCarty, 2001). The CHM recommendation to avoid animal fat follows directly, which Leviticus 3:17 supports. The CHM refers to animal fat, not essential fats that can be obtained from plant sources.

With ever increasing frequency, studies identify new salutary components of plants. Recent examples include walnuts, whole wheat, green tea, and blueberries. Walnuts may improve the lipid profile in type 2 diabetes due to their omega-3 acids and antioxidants (Tapsell et al., 2004). Whole wheat contains a complex phytochemical and antioxidant profile (Adom et al., 2003). Green tea may reduce the risk of hypertension (Yang et al., 2004). It contains many important compounds including the flavonoid epigallocatechin-3-gallate (Beecher, 2003). Blueberries contain resveratrol, an antioxidant which may also function as an anticancer compound (Schultz, 2004). How many studies purport newly recognized health benefits of animal products?

A recently published article, *Preventing Cancer, Cardiovascular Disease, and Diabetes* (Eyre et al., 2004), states that tobacco use, poor diet, and physical inactivity are the major risk factors for these diseases. The dietary recommendations point to a more plant-based diet. Quoting, "Dietary patterns that emphasize whole-grain foods and legumes and vegetables and fruits and that limit red meat, full-fat dairy products, and foods and beverages high in added sugars are associated with decreased risk of a variety of chronic diseases." Whenever discussed, the dietary pattern for a healthy diet stays the same: increase plant-based dietary choices. Their recommendations are not unique. Study after study makes similar statements. This point cannot be overemphasized.

To the first approximation, caloric intake approaches a zero-sum game. There are only so many calories a person can consume. In zero-sum caloric intake, moderate or heavy meat consumption occurs at the expense of more salutary, Creator-designed and initially-intended, plant foods. Despite the limited understanding of nutrient-gene-environment interactions, a consistent pattern emerges for a healthy diet: maximizing plant-based foods. The CHM suggested the minimization or even elimination of meat. Perhaps no meat may be a little impractical; however, no more than very minimal meat consumption is suggested by the model.

The ideal diet for human health will probably never be determined. At least we can take a cue from Scripture. Humans depend on plant life for health—a point taken to mean that the connection to the garden design has not been completely severed. If the connection remains, and since the initial design lacked disease, then trying to emulate a garden-like diet may be a reasonable strategy for reducing the probability of disease. It may be the best we can do in this probabilistic world.

Comparison of national consumptions patterns and rates of disease in specific countries may lead to the well-known ecologic fallacy (Gordis, 2000). Cause and effect are difficult to prove in such circumstances. To illustrate this point, one could erroneously argue that the increase in life expectancy in the United States over the last several decades results from the increased consumption of refined and processed foods. Although there may be merit in the observations cited, preferred are more controlled studies. The studies by Ornish et al. (1990, 2001), which restricted saturated fat among other lifestyle changes, were scientifically shown to reverse heart disease. These findings are very compelling. Recently, they have extended their work to prostate cancer (Ornish, 2003). Their scientifically proven interventions point to a more initial-creation diet as the most healthy.

None of the countries mentioned in the letter routinely attain the goal of 120 years of average life expectancy. Even if the ecologic fallacy does not apply, these nations still fall short. If one considers the goal to be reasonable, then their consumption patterns should not be held up as a standard. What would happen to life expectancy and morbidity if their diets became more plant based?

It is intriguing to speculate as to long-term, chronic dietary deficiencies and chronic disease etiology. What are the long-term effects of a diet deficient in sulforaphane, a compound found in broccoli, or resveratrol, found in blueberries? Should sulforaphane be an essential nutrient? One can ask the same of many plant-based compounds. Could cancer result from 20 or 30 years of inadequate dietary consumption of one of these compounds? Could other chronic diseases result from dietary lack of additional phytochemicals? How does diet affect the health of persons routinely living past 100 years? It seems absolutely certain that the list of dietary essential nutrients today will look vastly different in the future. Frequent publications identify an increasing number of putative salutary compounds. These compounds almost invariably originate from plants sources not animals.

The CHM is an incremental probability model of developing disease represented mathematically by the equation $P(D(i)) = \alpha(i) + \beta(i) * (e1 - e2)$. The parsimonious model identifies the probability of developing a disease as a function of an idiopathic risk added to a person's gene-environment interactions. Its introduction sets a framework to study health and disease from a creation perspective. The model is predicated upon a purposeful, garden-like design. The ever-expanding list of phytochemicals important in human health is exactly what one would expect from such a design and the model reflects this point. The emphasis on plant-based foods over animal products follows directly. We recognize that we live in a post-Fall, post-Flood world not the Garden. The Bible does not mandate vegetarianism, and the CHM does not argue for strict vegetarianism. The CHM does suggest, however, minimizing meat in favor of plant-based foods.

Outliers exist in any probability or statistical model. Individuals or a closely linked group can do well despite large deviations. This does not invalidate the model as long as it correlates with the overall data. The CHM consistently agrees with an increasing epidemiologic database that recognizes the importance of plant life in human health. Creation and the CHM fit the data better than evolutionary theory. The CHM is anathema to Darwinian evolution, which cannot explain health and disease in a meaningful context. Design and a creation health model make more sense as health and disease are not separable from Creation and the Fall.

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Hitchcock, A.S. 1971. *Manual of Grasses of the United States*. Dover Publications, New York.

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Creation Research Society

History—The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (graduate degrees in science) and about 1000 non-voting members. The Creation Research Society Quarterly has been gradually enlarged and improved and now is recognized as the outstanding publication in the field. In 1996 the *CRSQ* was joined by the newsletter Creation Matters as a source of information of interest to creationists.

Activities—The society is a research and publication society, and also engages in various meetings and promotional activities. There is no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund and research center are maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the Statement of Belief.

Statement of Belief—Members of the Creation Research Society, which include research scientists representing various fields of scientific inquiry, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution) both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.
3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.